CIPEC
Industrial
Energy
Efficiency

The Measure of Success –
For Thirty Years

Canadian Industry Program for Energy Conservation **2003/2004 Annual Report**

Natural Resources Canada
Ressources naturelles Canada

Canada

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CIPEC was created three decades ago as the embodiment of a unique vision: a voluntary partnership between government and business to champion industrial energy efficiency across Canada. From its inception in 1975, CIPEC's mission has been driven by people, companies and associations who have passionately advanced Canada's sustainable development agenda.

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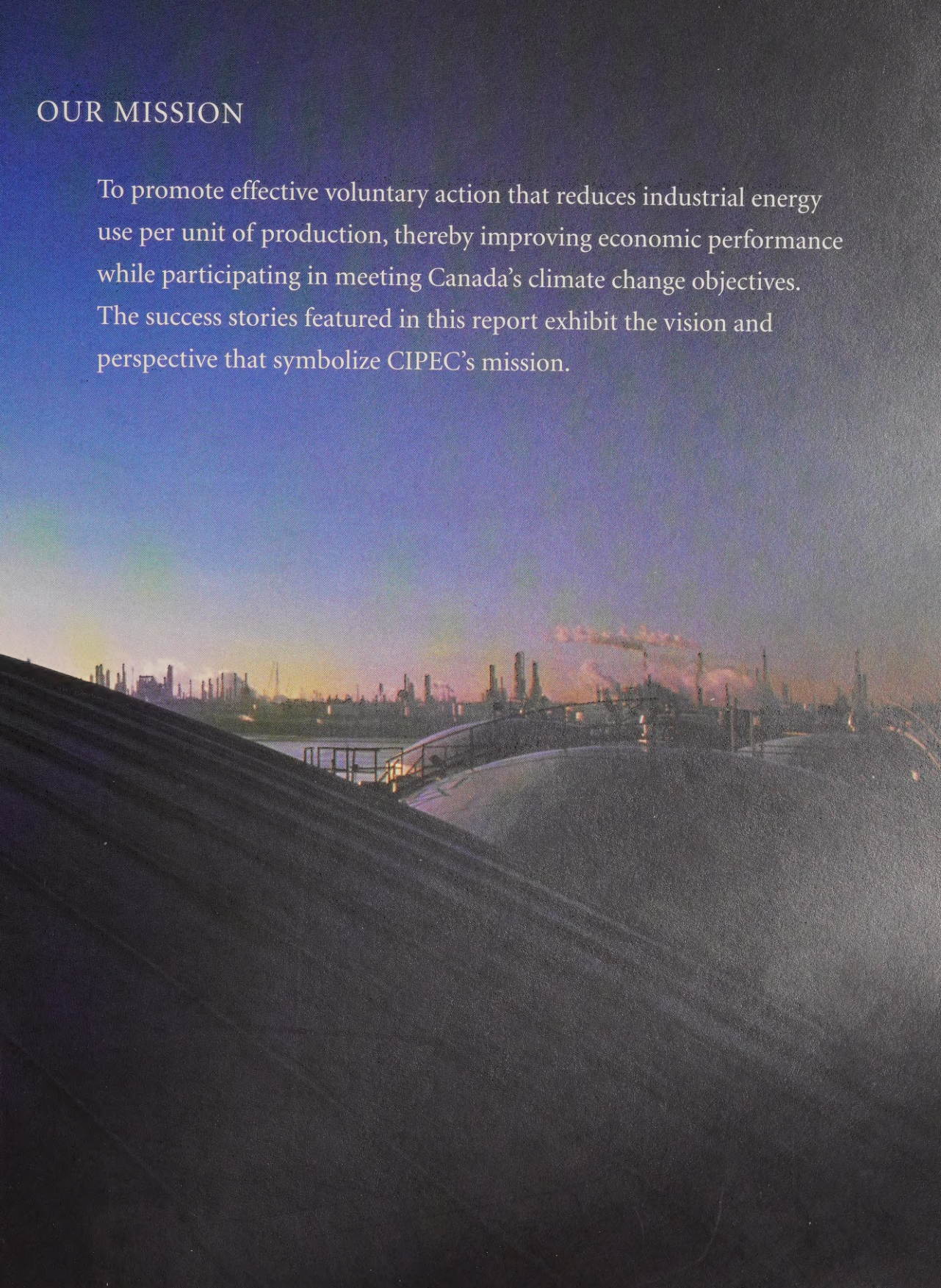
OUR MISSION

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives. The success stories featured in this report exhibit the vision and perspective that symbolize CIPEC's mission.



Procter & Gamble's Belleville, Ontario plant is on track to reduce energy consumption by 22.5 percent by the end of the 2006–2007 fiscal year. This Industrial Energy Innovator came up with many of its energy-saving ideas from Natural Resources Canada's Dollars to $ense workshops.

Message from the Chair

Douglas E. Speers
Chairman, Emco Corporation
Chair, CIPEC Executive Board

A Partnership Built for Performance

Founded in 1975 in response to the worldwide oil crisis, CIPEC is based on a clear vision of the vast potential for energy efficiency within Canadian industry.

CIPEC owes its well-established reputation as a valuable industry-government partnership to visionaries who believed that a successful partnership rests on the ability of both parties to work together in good faith and achieve measurable results. Over its 30-year history, CIPEC has adapted and evolved. When faced with challenges, imaginative people in both industry and government have stepped forward to reinvent, refocus and revitalize the organization. Their efforts established CIPEC's importance as an indispensable catalyst for industrial energy efficiency. Today, with industry leading the agenda and the federal government providing support, the two partners continue to work together toward mutually compatible goals.

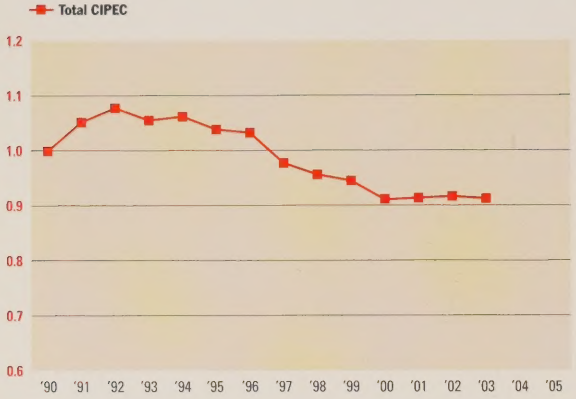
I urge you to take the opportunity to examine this 2003–2004 annual report. This publication tells the story of CIPEC's history and accomplishments, and celebrates the vision, action and achievements of Canadian industry.

A NOTEWORTHY SUCCESS

Canadian companies are increasingly relying on CIPEC for the guidance and expertise they need to curtail energy costs and boost profitability. As a result of CIPEC's efforts, the more than 5000 companies that represent over 98 percent of Canadian industry have reduced their combined energy intensity by 8.7 percent between 1990 and 2003, or an average of 0.7 percent per year. Improved energy management enabled Canadian industry to avoid approximately $3.4 billion in purchased energy in 2003, enough energy to meet the energy required to heat 4.8 million Canadian households for one year. Had energy

Total CIPEC Mining, Manufacturing, Construction and Energy Producers

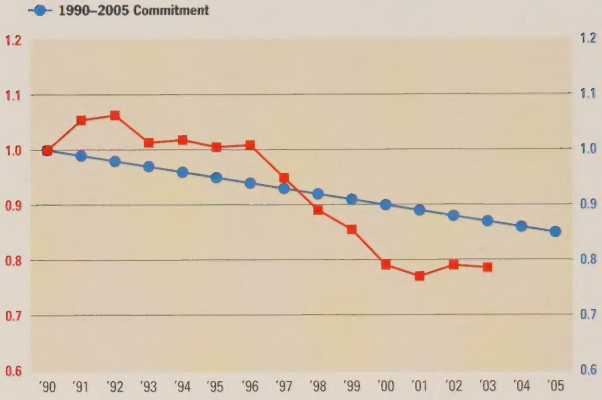
Normalized Energy Intensity
1990 = 1.00



All CIPEC industries improved their combined energy intensity by 8.7 percent, or an average of 0.7 percent per year for the period 1990 to 2003. Had energy intensity remained constant, GHG emissions would have been 27.8 megatonnes higher.

Mining, Manufacturing and Construction Progress Against Voluntary Commitments

Normalized Energy Intensity
1990 = 1.00



Mining, manufacturing and construction member industries improved their energy intensity by an average of 1.7 percent per year over the period 1990 to 2003. This surpasses the public voluntary commitment to achieve an average annual energy intensity improvement of 1 percent per year for the period 1990 to 2005 made by these CIPEC members.

intensity remained constant, industry's greenhouse gas emissions would have been 27.8 megatonnes higher.

The mining, manufacturing and construction sectors improved their energy intensity by an average of 1.7 percent per year over that period. In 2000, these CIPEC sectors made a public voluntary commitment to achieve an average energy intensity improvement of 1 percent per year for the years 1990 to 2005.

A COST-EFFECTIVE RESOURCE

Although CIPEC is proud of its success, work remains to be done. In recent years, advances in energy efficiency have become more difficult to achieve, and the improvement curve has flattened. Despite this trend, opportunities remain for CIPEC and its members. To capitalize on these opportunities, additional resources are needed to enable CIPEC to engage a wider circle of organizations, broaden the reach of its highly effective energy management programs, and lead a resurgence of energy efficiency activity throughout Canada's industrial sectors.

We were encouraged to see that the federal government's 2005 budget announced expanded energy efficiency funding. Tax incentives such as capital cost allowances for efficient cogeneration and renewable energy, wind power production incentives, and Partnership Fund and Climate Fund spending will all help industry move toward energy efficiency and the reduction of greenhouse gas emissions. It is a good start that must be reinforced and strengthened in the years to come.

CIPEC is an efficient and cost-effective organization. This is readily evident when you compare the money spent on the program with the energy efficiency gains made by participating industries and companies. Additional investments will enable CIPEC to broaden its positive impact on energy efficiency within Canadian industry, extend its reach to small and medium-sized

enterprises, and enhance Canada's potential to meet its Kyoto Protocol targets.

REACHING OUT

CIPEC's success is due to its simplicity. CIPEC, in cooperation with its 48 participating trade associations, is open to all companies who wish to improve their energy management practices. Participating companies, in turn, are encouraged to communicate their successes for the benefit of Canadian industry as a whole. To ensure that CIPEC's message is heard more broadly across Canada, we have stepped up our outreach program to both government and industry.

I have acted as an advocate for CIPEC in personal meetings with Natural Resources Canada Minister R. John Efford, Deputy Minister George Anderson, provincial ministers of energy and representatives from across Canada. We were delighted to be invited to attend the Council of Energy Ministers meeting held in Iqaluit, Nunavut, in July 2004. Our participation is an indication of CIPEC's growing importance in the advancement of Canada's industrial energy efficiency agenda.

Our cooperative efforts with the Conference Board of Canada led to the publication of *Why Energy Efficiency?* – a Conference Board paper which declares that energy efficiency is a sound business strategy which can be pursued with minimal risk and proven technology. It also offers ways for companies to overcome hurdles to developing energy efficiency programs of their own.

By fostering a greater appreciation of CIPEC's value among influencers and decision makers, we intend to gain greater support for cooperative voluntary action on climate change. We are greatly encouraged with the reception we have received. CIPEC is now being invited to the table by both the public and private sectors as an increasingly valuable industrial energy efficiency resource.

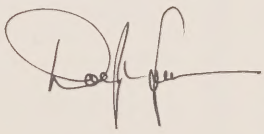
MORE WORK WITH LESS ENERGY

CIPEC will need a strong presence and a clear voice if it is to capably serve Canada. Lowering production costs will be a matter of survival, as international competitive pressures force Canadian companies to find efficiencies throughout their operations. For our industries to remain competitive and grow into the future, companies must find new and innovative ways to do more work with less energy.

CIPEC must be front and centre in the march toward global competitiveness. By providing tools and resources which support industry's efforts to implement more efficient technologies and find cleaner sources of energy, CIPEC will not only help Canadian industry remain world leaders, it will help raise the standard of living for all Canadians.

In closing, I would like to thank Natural Resources Canada and its dedicated people for their belief in, and unflagging support for, CIPEC. I would also like to acknowledge the outstanding commitment and contributions of Ms. Sue Olynyk (Chair) and the other members of the Task Force Council. Their ideas, commitment and tireless efforts on behalf of CIPEC have made it an unqualified success and a model for other public-private sector organizations.

Sincerely,



Douglas E. Speers
Chairman, Emco Corporation
Chair, CIPEC Executive Board

CIPEC The First

1973 / OPEC OIL CRISIS

1974 / OFFICE OF ENERGY CONSERVATION

The Government of Canada establishes the Office of Energy Conservation to develop and recommend a program of energy conservation. The price of oil increases to almost 2.5 times the 1973 level.

1975 / BIRTH OF CIPEC

The Government of Canada and 50 senior industry executives meet to deal with the energy crisis – effectively the beginning of CIPEC.

1976 / GOVERNMENT AND INDUSTRY FORM PARTNERSHIP

Establishment of the Canadian Industry Energy Conservation Task Forces, a voluntary sector-level partnership between industry and the federal government. Initially there were 10 sector task forces. An energy efficiency goal of a 12 percent improvement by 1980, with 1973 as base year, is established.

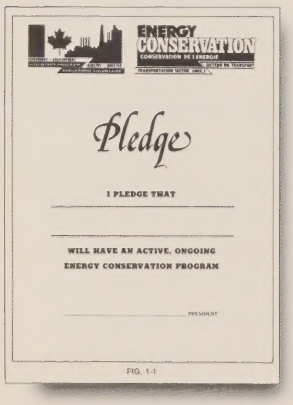


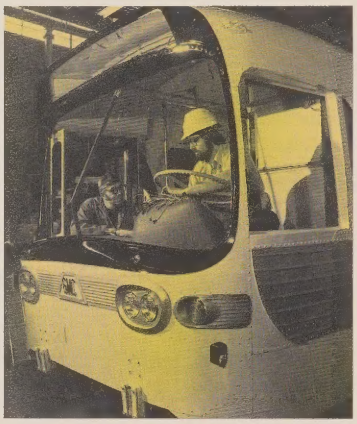
FIG. 1-1

1978 / INTERNATIONAL RECOGNITION

Canada's voluntary Industrial Energy Conservation Program is cited by the International Energy Agency as "worthy of emulation by other member countries."

1979 / GOAL SURPASSED

Participating industries meet and exceed the initial 1976 energy efficiency goal, one year ahead of schedule.



1980 / NATIONAL ENERGY PROGRAM

Having met the 1980 goal, a new voluntary energy efficiency goal is established, namely a 23 percent improvement with 1972 as base year. The Government of Canada's National Energy Program provides increased funding for the task forces. The price of oil is more than five times higher than what it was in 1973.

1982 / NEW NAME/NEW LOGO

Name change to Canadian Industry Program for Energy Conservation (CIPEC) as well as a new logo in May. Government announces extra funding for energy audits ($40 million over three years).

1983 / POST RECESSION REBOUND

Industrial energy efficiency rebounds from the setbacks of the 1981 and 1982 recession years to set a new high-water mark. The number of reporting companies grows from 663 to 704.

1985 / 10 YEAR ANNIVERSARY

CIPEC celebrates its 10th anniversary. Having met the 1985 goal, a new five-year target of 31 percent is established over the existing base year.

1987 / BRUNDTLAND REPORT

The World Commission on Environment and Development publishes *Our Common Future*. Known as the **Brundtland Report**, the document develops guiding principles for sustainable development, as it is generally understood today.

1988 / WORLD CONFERENCE ON CHANGING ATMOSPHERE

The federal government cancels the National Energy Program. The World Conference on "The Changing Atmosphere: Implications for Global Security" held by Canada in Toronto calls on "government and industry to reduce carbon dioxide (CO_2) emissions by approximately 20 percent of 1988 levels by the year 2005 as an initial global goal." Price of oil declines to only 50 percent higher than what it was in 1973.

1989 / INDUSTRY BACKS CIPEC

CIPEC and the Government of Canada debate whether or not to continue the program; industry reconfirms necessity and opens discussions with government.

Thirty Years

1990 / THE GREEN PLAN

Government of Canada's **Green Plan for a Healthy Environment** renews interest in CIPEC and provides a focus for a renewed voluntary industry-government partnership.

1991 / CIPEC RETOOLS

The industry and the government plan a new organization that includes sector task forces, a task force council and, for the first time, an executive board to provide top-down leadership as well as advice to the Minister of Energy, Mines and Resources on industrial energy efficiency matters.

1992 / CANADA SIGNS THE RIO ACCORD

Canada signs the **Rio Accord**, committing to stabilizing greenhouse gas (GHG) emissions at 1990 levels by the year 2000. The new CIPEC is officially launched with a new mission statement that combines enhancing efficiency and economic performance with meeting Canada's emission objectives.

1994 / CO_2 STABILIZATION

CIPEC commits to achieving "industrial CO_2 stabilization at 1990 levels by the year 2000, on the assumption of an annual industrial growth rate of no more than 2.0 percent." Development of new data tracking and reporting process under the auspices of Statistics Canada and the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC).

1995 / DEBUT OF INDUSTRIAL ENERGY INNOVATORS

Official launch of Industrial Energy Innovators (IEI) and Canada's Climate Change Voluntary Challenge and Registry Inc. By December, 178 companies have made a voluntary commitment to implement, review and report on energy efficiency measures. CIPEC participation now includes 15 industrial trade associations.

1997 / KYOTO PROTOCOL SIGNED

Canada signs the **Kyoto Protocol**, committing to reducing GHG emissions to 6 percent below 1990 levels. Launch of twice-a-month newsletter, *Heads Up CIPEC*. The first issue goes to 55 readers.

1998 / CHARTING A COURSE ON CLIMATE CHANGE

CIPEC participates in the Climate Change Industry Issue Table process to help the Government of Canada develop a climate-change response. The price of oil declines to approximately 1973 levels.

1999 / GHG EMISSIONS STABILIZED

CIPEC reports that energy-use-related GHG emissions are at 1.9 percent below 1990 levels, while total energy saved since 1990 represents 73 percent of Canada's residential heating demand in 1998.

2001 / ENERGY PRODUCERS JOIN CIPEC

The CIPEC network expands to include energy producers. The *Government of Canada Action Plan 2000 on Climate Change* supports new tools and services, including energy audits, sector benchmarking and best-practices guides. Forty-five trade associations representing more than 5000 companies and 95 percent of secondary industrial energy demand are now involved in CIPEC.

2002 / EMN LAUNCHED

Launch of CIPEC Energy Managers Network for industrial energy practitioners. *Heads Up CIPEC* goes on-line, averaging more than a quarter of a million hits per month. An independent evaluation of the CIPEC program reveals that the growth in energy use by CIPEC participants is only one-half that of non-participants. CIPEC industries have avoided more than 25.2 megatonnes of GHG emissions since 1990.

2004 / A NEW VISION

Participation in CIPEC increases to 47 trade associations and 519 IEIs. Independent study confirms that annual industrial savings from Dollars to $ense energy management workshops amount to 180 000 tonnes of GHGs and $32 million. CIPEC's Executive Board endorses a vision of doubling energy savings over the next three years. Price of oil is 2.5 times the 1973 level.

2005 / CELEBRATING 30 YEARS

The Energy 2005 Conference provides a forum to celebrate CIPEC's three decades of a successful industry-government partnership.

Industrial Energy Innovator Suncor Energy Inc., in partnership with Enbridge and EDF EN Wind Power Canada Inc., commissioned a $48 million, 30-megawatt wind power project in Magrath, Alberta. By 2014, the project will receive $9 million from the Natural Resources Canada's Wind Power Production Incentive.

Vision

CIPEC was created three decades ago as the embodiment of a unique vision: a voluntary partnership between government and business to champion industrial energy efficiency. From its inception in 1975, CIPEC's mission has been driven by people, companies and associations who have passionately advanced Canada's sustainable development agenda.

PARALLEL INTERESTS CONVERGE

In the early 1970s, an unprecedented, worldwide interruption of oil production, accompanied by rapidly escalating prices, threw the world economy into turmoil. Seeking to give Canada greater control over its energy policy, the Government of Canada launched consultations with industry to identify ways Canada could improve its energy efficiency.

Government and industry came to the table with different perspectives on energy efficiency. The federal government believed that if Canada was to maintain a secure supply of energy, it was essential to reduce the country's dependency on foreign oil. Projecting energy demand into the future, it feared that unless demand growth was curbed, energy costs would total more than $20,000 per family by 1985. It saw energy efficiency as a key element in its efforts to thwart this trend and reduce oil imports.

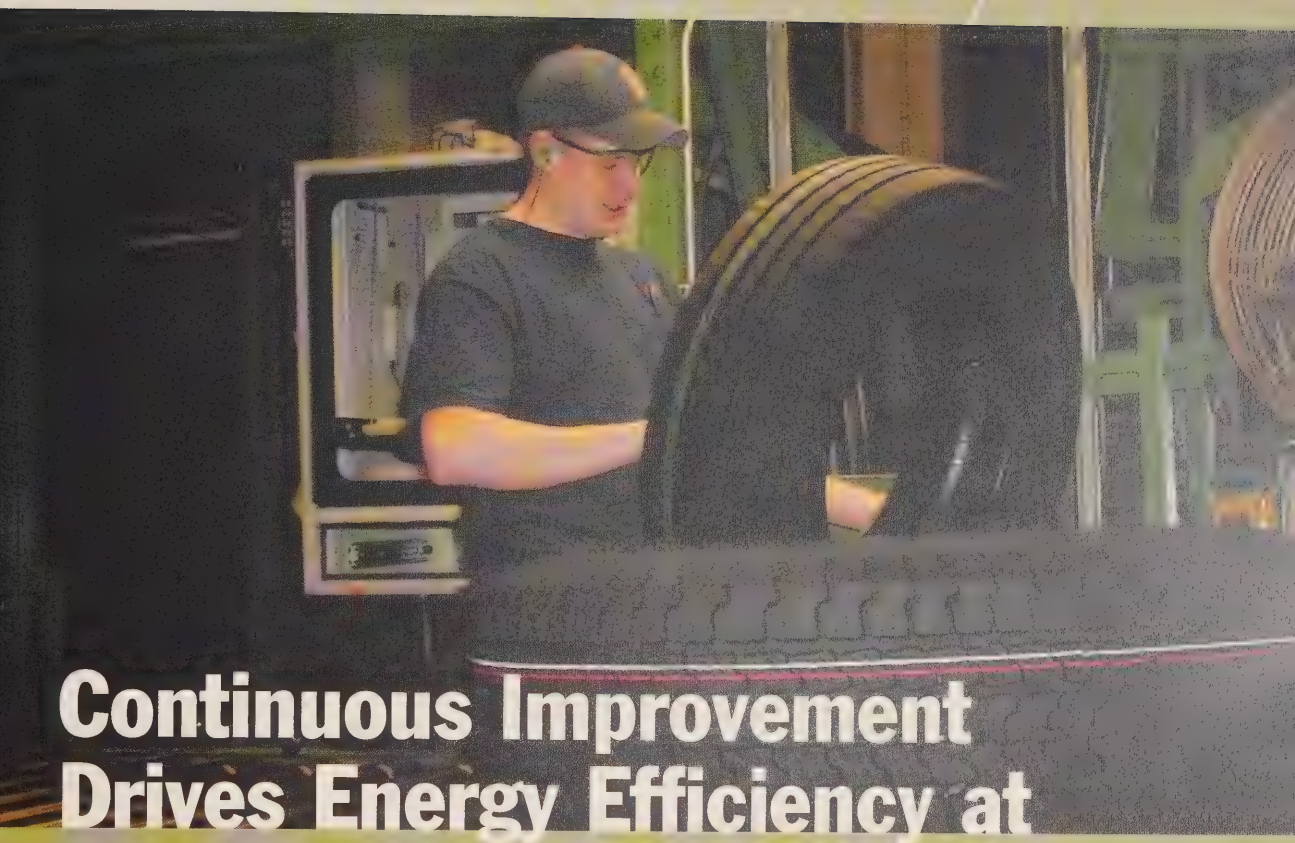
Canadian industry also feared the impact of runaway energy prices and insecure oil supplies. Rising oil prices made business planning more complex, and had the potential to weaken markets and undermine competitiveness. Industry foresaw that more efficient use of energy had the potential to reduce uncertainty, enhance competitiveness and improve the bottom line.

Both parties realized that continuing on the previous path of rapidly escalating energy consumption was not an option.

THE CIPEC SOLUTION

Out of these government/industry consultations, the Canadian Industry Program for Energy Conservation (CIPEC) was born. Originally named the Canadian Industry Energy Conservation Task Forces, CIPEC was established as a voluntary partnership between the federal government and the private sector. This relationship was possible because, while the reasons the parties sought energy efficiency differed, the goal was the same: to reduce energy consumption in Canada.

From the beginning, the roles were clear: government would provide tools, support and a policy framework, and industry would seek out and implement energy efficiency measures. Industry would set targets and collect energy data, thereby enabling performance to be tracked and progress reported.



Continuous Improvement Drives Energy Efficiency at Goodyear

Photo courtesy of Goodyear

Rapidly Escalating energy consumption was not an option

Speaking to the first Government and Industry Energy Conservation Conference on May 23, 1975, Energy, Mines and Resources Minister Donald S. MacDonald described the relationship simply: "We feel that we can pool our talents and thereby help each other."

THE EVOLUTION OF A UNIQUE PARTNERSHIP

Thanks to the convergence of interests, CIPEC became a nearly instant success. By the end of 1979, companies participating in CIPEC represented 80 percent of Canada's industrial energy consumption. In the first four years of the program, these organizations exceeded CIPEC's 1980 target of a 12 percent improvement in energy efficiency a full year ahead of schedule. In his 1979 annual report introductory letter to Energy, Mines and Resources Minister Marc Lalonde, Task Force Coordinating Committee Chair C. A. Wolf, Jr. of Union Carbide Canada Inc. proclaimed, "The achievements to date demonstrate that, with candid co-operation between industry and government, industry is aggressively practising energy conservation on a voluntary basis."

In CIPEC's first decade, participants focused on the conservation of crude oil, reducing oil consumption from 32 percent of the total Canadian energy mix to 17.5 percent. Companies furthered energy management by improving process design, applying "just-in-time" manufacturing strategies, adopting CAD/CAM and robotics technologies, and introducing computer-integrated manufacturing systems. These activities were enhanced by substituting fuels and materials, implementing energy conservation practices, and developing employee awareness programs.

During the recession of 1982–1983, companies shifted their energy management activities to the shop floor, further enhancing energy efficiency through closer monitoring and control of processes, and the adoption of higher production and maintenance standards. By the mid-1980s, companies in a number of industries found advantages in recovering waste products for use as sources of energy.

As CIPEC companies continued to refine their energy efficiency programs through the late 1980s and early 1990s, government and industry officials were taking a hard look at CIPEC. Although the partnership had served both sides well since the mid-1970s, the cancellation of the National Energy Program in 1988, and a shift in Canada's energy policy priorities, caused high-level CIPEC and government officials to question the organization's relevance.

However, Canada's 1990 Green Plan for a Healthy Environment sparked a renewed interest in CIPEC and generated support for the voluntary program. CIPEC was

Heat Recovery Saves Energy at Maple Leaf Foods

Collaborative Approach Weaves Energy Program at Doubletex

With the help of the expertise and resources available through Natural Resources Canada (NRCan), the Canadian Textiles Institute and the CIPEC Energy Managers Network, Doubletex of Montréal, Quebec, is making notable progress in improving its energy efficiency.

Following a plant restructuring, Doubletex conducted a thorough heat and mass balance study with NRCan's help. The study identified a number of measures which, when combined, will save several thousand dollars in wasted energy.

The company is working on projects to capture and reuse vented steam energy from its boilers, and to use excess hot water recovered from effluent to preheat cold process water to a constant 21°C. Doubletex is also refurbishing its SOLAME hybrid water heater to enable it to operate solely on heat captured from boiler exhausts, and is evaluating an opportunity to save natural gas by the use of an off-peak electric alternative boiler which would bring the utilization factor for hydro from a meagre 52 percent to about 90 percent. To ensure that it continues to receive the benefits of its energy efficiency programs, the company monitors its daily natural gas and electricity consumption to help it quickly find and correct energy-wasting malfunctions.

refocused, and its mission statement revised to reflect a combined focus on energy efficiency, economic performance and climate change. By 1992, CIPEC was a reinvigorated organization that included sector task forces, a task force council and an executive board to provide top-down leadership as well as advise the Minister of Energy, Mines and Resources on industrial energy efficiency matters.

Throughout the 1990s, momentum for industrial energy efficiency continued to build with the unfolding of Canada's climate change agenda. CIPEC expanded its relationship with Canadian industry by encouraging individual companies to seek win-win solutions – boosting profit margins and reducing GHG emissions through effective energy management.

To assist, Natural Resources Canada (NRCan) created the Industrial Energy Innovators (IEI) initiative in 1995. Closely aligned with Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.), IEI engaged companies to voluntarily commit to improving energy efficiency. In return, companies received enhanced tools, support and services to meet their energy management objectives.

The Kyoto Protocol to the United Nations Framework Convention on Climate Change, negotiated in 1997, raised Canada's obligation to mitigate climate change. Canada's commitments on the world stage sparked a renewed interest in industrial energy efficiency on the domestic front. After an extensive consultation process, the Government of Canada doubled its financial commitment to the partnership under its *Action Plan 2000 on Climate Change.*

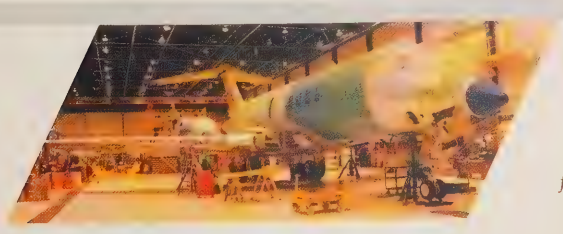
This increased commitment has provided the means to expand the program to include the upstream oil and gas and electricity generating sectors. It further paved the way for the program to enhance its outreach capabilities and bring new players to the table.

POWERED BY VISION

The energy efficiency agenda within Canadian industry has been propelled by people and organizations of vision. For example, Husky Injection Molding Systems Ltd. founder Robert Schad made sustainability the cornerstone of his company's business philosophy. Husky incorporates environmental considerations into the design of every operating system and building plan. Equipment is purchased and facilities are built to maximize energy efficiency and minimize greenhouse gas emissions. Business systems and practices are designed to reduce travel and shrink the company's environmental footprint.

In one recent venture, Husky has partnered with the Moose Deer Point First Nation, located in Ontario, to establish a model sustainable community. The community includes a 15-machine injection moulding plant which generates a large portion of its power requirements using propane-powered fuel cell technology. The fuel cells use hydrogen from propane and oxygen from the air to produce electricity, water and useful heat. By using waste heat from the fuel cells and implementing the latest energy-efficient technologies, non-process purchased energy will be reduced by 72 percent.

At INVISTA (formerly DuPont Canada Inc.) energy manager and CIPEC champion Peter Chantraine (now retired) foresaw that to continue making significant gains, the company would need to find new ways to finance its energy efficiency investments. He steered the company toward energy performance contracting, a concept used extensively in government, but rarely employed in the private sector. Performance contracting enables organizations to arrange outside financing for projects which improve energy efficiency, and pay back the financing with the savings generated.



Industrial Energy Innovator Bombardier Aerospace's plant in Downsview, Toronto, Ontario, is saving $120,000 a year on electricity bills by upgrading to new energy-efficient air compressors. The payback period for new equipment is 1.5 years.

Industry associations are developing bold energy efficiency Strategies

Mr. Chantraine and his team began with a model used in the Government of Canada's Federal Buildings Initiative, modifying it to meet the needs of an industrial application. Finalized in 1999, after two years of negotiation, the energy performance contract mechanism provided management with a powerful energy management tool at its facilities in Kingston and Maitland, Ontario. The initial projects implemented under this financing strategy are projected to cut INVISTA's direct GHG emissions by a total of nearly 75 000 tonnes per year, and reduce the company's energy use by about 10 percent.

Interface Flooring Systems (Canada), Inc. of Belleville, Ontario, takes sustainability one step further: it seeks to become a net contributor to the environment. The company thinks outside of the box to develop sources of "green" energy and minimize energy consumption, and to control the environmental impact of its products throughout their life cycle. Interface's commitment to sustainability is driving it to invest in new technologies, seek out and adopt innovative concepts and continuously upgrade practices to improve its environmental performance.

Industry associations, too, are developing bold energy efficiency strategies for their sectors. For example, the Mining Association of Canada (MAC) is a world leader in the development and promotion of energy efficiency within its member companies.

MAC monitors energy and environmental performance and encourages mining companies to continuously improve energy efficiency through involvement with CIPEC and the former VCR Inc. To help its members, MAC has published "Strategic Planning and Action on Climate Change," with the help of the Pembina Institute, Stratos Inc. and NRCan's Office of Energy Efficiency. The guide was prepared to help the mining industry devise climate change principles and strategies that support long-term GHG reduction efforts.

30 YEARS LATER, REMARKABLY RELEVANT

Despite its age, and the sea of change around it, CIPEC's mandate, and the symbiotic relationship it represents, remains remarkably relevant. Globalization, the explosion of new technologies, the ongoing transition to an information economy and other economic and social trends have served to strengthen CIPEC's foundations. Now celebrating its 30th anniversary, CIPEC continues to set the standards for voluntary public/private sector joint ventures, serving as a model for other such ventures around the world.

Big Foot Heaters Reduce Environmental Footprint for Ford Motor Company of Canada

An investment in Big Foot [illegible] Ford Motor Company of Canada, Limited [illegible] Ford installed a total of [illegible] two 100-litre power [illegible] generated significant energy cost savings and [illegible] energy efficiency initiatives. Ford has reduced energy consumption [illegible] baseline year and emissions [illegible] The company is on target to [illegible] every year between 2000 and 2005, and Ford hopes [illegible] emissions intensity over the same period.

Industrial Energy Innovator Devon Canada Corporation has cut energy use per unit of production by 4.4 percent between 1994 and 2002 and has reduced emissions per unit of production by 6 percent.

Action

CIPEC's ever-growing success

emerges from the willingness of its public and private sector partners to back the pursuit of energy efficiency with ideas, resources and commitment. Collectively, their actions have created new standards for energy management in Canada.

CIPEC was designed to promote and support action. CIPEC leaders have consistently understood that progress depends on a clear process: assess where you are, target where you are going, track results, report on progress and celebrate success.

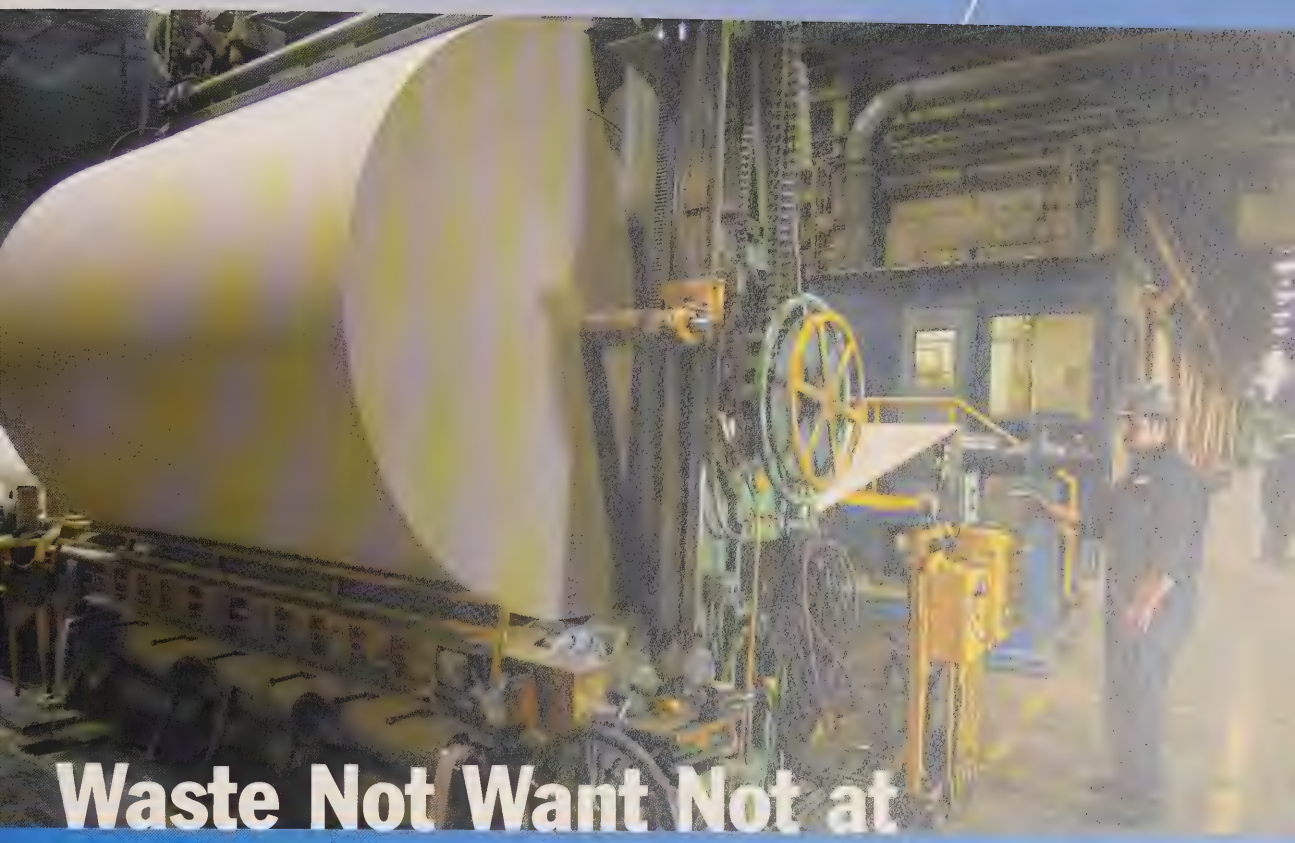
From the beginning, the organization's goal was to strengthen all steps in this process by connecting industry with practical knowledge about energy-efficient technologies, best practices and innovative concepts. It was established as a conduit for ideas, information, resources and networking among organizations committed to energy efficiency.

CIPEC workshops, for example, have brought hundreds of industrial energy practitioners useful information to help implement, improve and monitor their energy efficiency programs. Benchmarking studies, conducted jointly with sector associations, bring industrial users best practices information and provide them with contextual information to take steps to elevate their performance. Energy audits, which uncover energy waste and identify efficiency opportunities, provide companies with specific "nuts and bolts" information related to improving the energy efficiency of their own operations. And publications, from sectoral energy guides to financial planning, management and benchmarking guides, provide practical information on establishing and operating effective energy management programs.

INNOVATION IN ACTION

Drawing on these resources, and the knowledge, experience and support of other companies, Canada's industrial organizations continue to move ahead by adopting renewable energy technologies, re-engineering processes and formalizing energy management systems.

Rubbermaid Canada's Calgary plant gets organized on energy savings. The Industrial Energy Innovator took advantage of Natural Resources Canada's Industrial Energy Audit Incentive and identified approximately $155,000 in estimated annual savings with an overall payback period of 1.2 years.



Waste Not Want Not at Emco Pont-Rouge

The Emco building materials plant in Pont-Rouge, Quebec, is using previously wasted exhaust heat to save hundreds of thousands of dollars per year in energy expenditures. The plant has installed a system to divert hot effluent vapour from the chimney to preheat process water. By replacing the use of natural gas-generated steam to heat water in its tubs, the company not only saves money, but also gains better control of process temperatures. The Pont-Rouge plant installed its first exhaust heat exchanger in June 2003, with a second added in February 2004.

Emco Building Products Corp. estimates that the project has reduced annual natural gas consumption by 1 546 019 cubic metres, with a corresponding reduction in carbon dioxide equivalent emissions of 2916 tonnes. Direct energy savings from the project average about $40 000 per month, providing a payback period on investment of less than 21 months.

The Pont-Rouge facility expects that an expansion in the use of waste energy in 2005 will lead to additional energy savings of more than $600 000 per year.

Going with the Flow Electrifies Atwood Cheese Company

At the end of 2001, facing an expected increase in electricity costs due to deregulation, Atwood Cheese Company of Atwood, Ontario, decided to look for ways to reduce plant energy consumption. Preliminary tests indicated that the installation of an ElectroFlow integrated power conditioning system could save Atwood about 5 percent in electricity costs, while providing additional operating benefits.

Since installing the system at the beginning of 2002, the results have been impressive. The company's annual electricity demand dropped by 7.8 percent in 2002, while its power factor increased to 94.7 percent – an improvement of nearly 2 percent. Kilowatt hours (kWh) consumed, when adjusted to reflect the previous year's hours of operation, fell by 6.8 percent.

Besides improving electricity consumption efficiency, ElectroFlow enhances power quality throughout the plant, protects equipment, prolongs operating life, reduces downtime and cuts maintenance. It's a winning combination of energy efficiency and operating savings with an investment payback period of just two years.

TAPPING RENEWABLE SOURCES

Among the wide range of options available to today's innovative companies are renewable sources of energy. For example, Suncor Energy Inc., widely known as a hydrocarbon energy producer, has partnered with Enbridge Inc. and EHN Wind Power Canada, Inc. in a $48-million project in Alberta to harness the wind. The 20-turbine Magrath Wind Power Project generates 30 megawatts of green electricity, enough to power 13 000 homes.

Canadian companies are also tapping into solar energy technology. Consoltex Inc., a Canadian manufacturer of synthetic woven fabrics, installed a low-cost Solarwall to use the sun's energy to preheat ventilation air in an extension to its Cowansville, Quebec, facility. The nearly maintenance-free Solarwall enables Consoltex to increase its ventilation airflow while minimizing its heating costs. Other Industrial Energy Innovator companies including Ford Motor Company of Canada, Limited, Cascades Inc., Bombardier Inc. and Goodyear Canada have also installed Solarwalls in their Canadian facilities.

Pioneering new technologies are also emerging. With the help of DynaMotive Energy Systems Corporation, Erie Flooring and Wood Products has begun drawing green electrical power from a revolutionary new waste-to-energy system at its West Lorne, Ontario, facility. The DynaMotive-built system creates BioOil from Erie Flooring's wood waste and uses it to fuel an Orenda power generation system. The system is capable of generating 2.5 megawatts of electricity and 12 000 lb./hr. of steam for Erie Flooring's operations, while also providing green power to Ontario's electrical grid.

Ropak Can-Am Ltd., a manufacturer of plastic packaging products, is the first industrial site in Canada to use geothermal energy from flood water in abandoned mines to provide heating and cooling. At the company's facility in Springhill, Nova Scotia, mine water at a temperature of 18°C (64°F) is pumped through a heat pump system and re-injected into a separate (but linked) mine. The system saves the company about 600 000 kWh in energy each year.

RE-ENGINEERING INDUSTRIAL PROCESSES

Companies are also re-engineering processes to boost their energy efficiency and reduce their operating costs. For example, building supplies manufacturer Matériaux Cascades Inc. of Louiseville, Quebec, and felt floor coverings producer Cascades Lupel Inc. of Cap-de-la-Madeleine, Quebec, have developed an ultra-filtration system that reduces the amount of waste water and suspended solids produced by plant processes. The system is two to three times more energy efficient than conventional biological treatments. Matériaux Cascades paid back its $300,000 investment within a year. Cascades Lupel saved approximately $750,000 by recovering chemicals.

Aerospace services supplier Standard Aero Limited of Winnipeg, Manitoba, is employing the leading-edge technology of Manitoba Hydro's Power Smart™ design to develop an advanced compressed air system that performs better and consumes less energy. The main system's 100-horsepower variable-speed drive compressor enables Standard Aero to operate its tools and equipment efficiently at low demand, without losing the capacity to increase to

Suncor Energy Inc. is committed to renewable energy. The Industrial Energy Innovator is a founding member of the Clean Air Renewable Energy Coalition and its two wind-farm projects are expected to offset greenhouse gas emissions by about 115 000 tonnes annually.

full power when needed. Large high-pressure air-storage receivers on a separate short burst, high demand testing system ensure that the company has adequate air supplies, while recharging at night, when power is less expensive.

The testing system's state-of-the-art thermal-mass refrigerated dryer runs only as required, enabling the dryer to use much less energy than conventional fixed-cycle desiccant dryers or conventional refrigerated dryers. Heat-recovery units recycle waste heat from both systems to supplement the facility's heating requirements in winter months. The enhanced energy efficiency of the systems has led to substantial operating cost savings and an annual reduction in GHG emissions of 30 tonnes.

Staff at Aluminerie Lauralco Inc., a subsidiary of Alcoa Inc., have optimized the Faraday efficiency of the electrolytic process in the company's aluminum smelter in Deschambault, Quebec, to more than 96 percent, resulting in energy consumption reductions of nearly 13 000 kWh per tonne of aluminum. Additional efforts include measures to reduce anode effects and lower fluorocarbon emissions. The company has also set up an energy committee to focus on continuing efforts to further reduce the plant's energy consumption and lower fluorocarbon emissions.

Eka Chimie Canada Inc., which manufactures sodium chlorate for the pulp and paper industry at its Salaberry-de-Valleyfield, Quebec, plant, now recycles waste hydrogen from the manufacturing process and uses it to dry sodium chlorate. The company expects this approach to reduce its annual electricity bill by $225,000 – or 6400 megawatt hours (MWh).

The Montupet Ltée. smelter in Rivière-Beaudette, Quebec, has implemented a project to recycle sand. The smelter has installed an energy-efficient natural gas furnace that has enabled it to recycle almost 100 percent of its sand. This system has resulted in a cash saving of about 90 percent per tonne and a subsequent investment payback period of less than two years.

Textile producer CookshireTex Inc. of Cookshire, Quebec, has converted its operations to natural gas, and is recovering heat by direct contact. The improvement is saving the plant 5000 MWh a year, and has eliminated the need to install a new boiler.

Crossley Carpet Mills Limited responded to an announced increase in power rates by undertaking energy-saving measures throughout its Truro, Nova Scotia, manufacturing facility. The company installed a radio frequency dryer, a closed-loop cooling system and a steam-coil heater to increase efficiency in major mill processes. Crossley turned to variable frequency drives, "soft start" systems and electronic process control to further mitigate energy costs associated with fluctuating mill loads and the use of materials, and improved lighting and filtering systems to reduce warehousing and maintenance expenses.

Timminco Metals' magnesium reduction and extrusion plant in Haley, Ontario, installed twin-bed natural gas heat-reclaimer burners in a retort furnace to reclaim hot flue gases and use them to preheat combustion air. The efficient design preheats the combustion air to within 85 to 95 percent of the flue gas temperature, thus reducing the fuel input required to heat cold air to furnace temperature. The twin-bed burners resulted in 38 percent

Imperial Oil Limited is integrating energy efficiency into its day-to-day operations. Between 1995 and 2004, the Industrial Energy Innovator has improved energy efficiency by 15 percent.

Energy Ideas Pour in from Elk Falls Division at NorskeCanada

NorskeCanada's Elk Falls Division is distinguishing itself as an energy efficiency leader. The integrated pulp and paper facility located on Vancouver Island is improving its energy management by taking a practical and innovative approach to mitigating the use of fossil fuels.

With a new energy management team in place, Elk Falls incorporated energy management software to constantly monitor the mill's steam needs and control fuel supply to the power. The software helped to offset fossil fuel with hog fuel (a biomass fuel that consists of a mixture of bark wood, sawdust and shavings). This software has also improved the power output from the mill's turbo generator, thus reducing demand from local utilities. As well, the mill upgraded and established new operating practices in its recovery boiler to generate more steam from black liquor to further reducing fossil fuel use. On the conservation front, Elk Falls also reduced mill water use by 10 percent through process modifications.

In total, direct greenhouse gas emissions from NorskeCanada's four divisions have dropped by 67 percent between 1990 and 2004. The reduction results from mill modernization, energy efficiency gains and switching to less greenhouse gas-intensive fuels such as natural gas.

Pioneering Technologies are emerging

lower gas consumption (31 terajoules (TJ)/year), and annual energy savings from the twin-bed burners amount to $110,000.

In 1987, the Québec Cartier Mining Company began installing a unique technology to optimize the use of steam at its Port-Cartier, Quebec, pellet plant. The Steam-Condensate Closed System (SCCS) allows condensate to return in a closed pressurized loop to be reboiled. Since its installation at Québec Cartier Mining, the SCCS has reduced energy consumption by 18 percent compared to a conventional steam-condensate open system.

FRE Composites Inc. designed and manufactured seven hot-air electric convection ovens at its St-André-d'Argenteuil, Quebec, manufacturing facility which incorporate high-power density resistance heating. The new ovens provide more accurate control over all process stages and double the production capacity with no increase in personnel requirements. Because each of the seven ovens is entirely autonomous, production flexibility is improved, while reducing energy demand by 80 percent compared to the previous system.

By replacing an existing conventional furnace with a natural-gas-fired rapid heater for its forging operations, MTC Suspension Inc. has demonstrated the efficiency and profitability of the smaller, more efficient heaters for metals. The heavy-duty vehicle spring manufacturer from Chambly, Quebec, has reduced energy and operating costs by about $50,000 per year, while improving product quality.

Independent western Canadian oil and gas producer Penn West Petroleum Ltd. of Calgary, Alberta, focuses on energy efficiency and natural gas conservation as its principal means of reducing GHG emissions. The company has conducted an emission audit program at its 26 facilities, leading to an extensive equipment repair program. The company has also made numerous process and equipment changes to improve its environmental performance. Since 1996, despite rapid growth, Penn West has succeeded in reducing its energy intensity by 11 percent.

In 1994, textile manufacturer Manoir Inc. installed a relatively new energy-saving technology at its St. Laurent, Quebec, facility: a direct-contact economizer. The economizer, which was further upgraded and expanded in 1999, uses hot waste water leaving the plant to heat cold water entering the plant. By preheating this fresh water, less energy is consumed in the manufacturing process. The device performed so well that the company opted to install a boiler-stack heat-recovery unit to recover heat escaping through the boiler chimney. The two installations have cut the company's natural gas consumption and reduced GHG emissions by 1500 tonnes per year.

Stackpole Limited of Oakville, Ontario, is at the leading edge of the use of metallurgical powders in

automobile component manufacturing. The company has received assistance from NRCan's CANMET Energy Technology Centre's Industry Energy Research and Development Program to produce and improve high-strength automotive components, allowing powder metallurgy to break into markets served traditionally by castings and steel stampings. Since 1982, this collaboration produced energy savings of 3.6 petajoules, resulting in a reduction of GHG emissions of 180 000 tonnes.

Calgary, Alberta-based Husky Energy Inc. recently implemented a series of projects to reduce GHG emissions at its facilities in Canada and China. The oil and natural gas company's efforts include more effective management of emissions venting, projects to reduce electricity and fuel gas consumption, and a flare gas conservation program. These efforts have enabled Husky to reduce its CO_2 equivalent emissions by almost 1.4 million tonnes in the 2002–2003 reporting year. The company's cumulative emissions reductions now total almost 3.5 million tonnes of CO_2 equivalent per year.

Also headquartered in Calgary, NOVA Chemicals Corporation employs leading-edge technologies to increase the energy efficiency of its Canadian chemical manufacturing facilities. The company now uses cogeneration and hydroelectric energy as the primary sources of power for every one of its Canadian manufacturing sites, and has been a leader in efforts to track and report energy efficiency performance. In 2003, the company reported that the total emissions intensity of its Canadian facilities improved from 1.02 in 2002 to 0.93 in 2003, coupled with an increase in production of 9 percent.

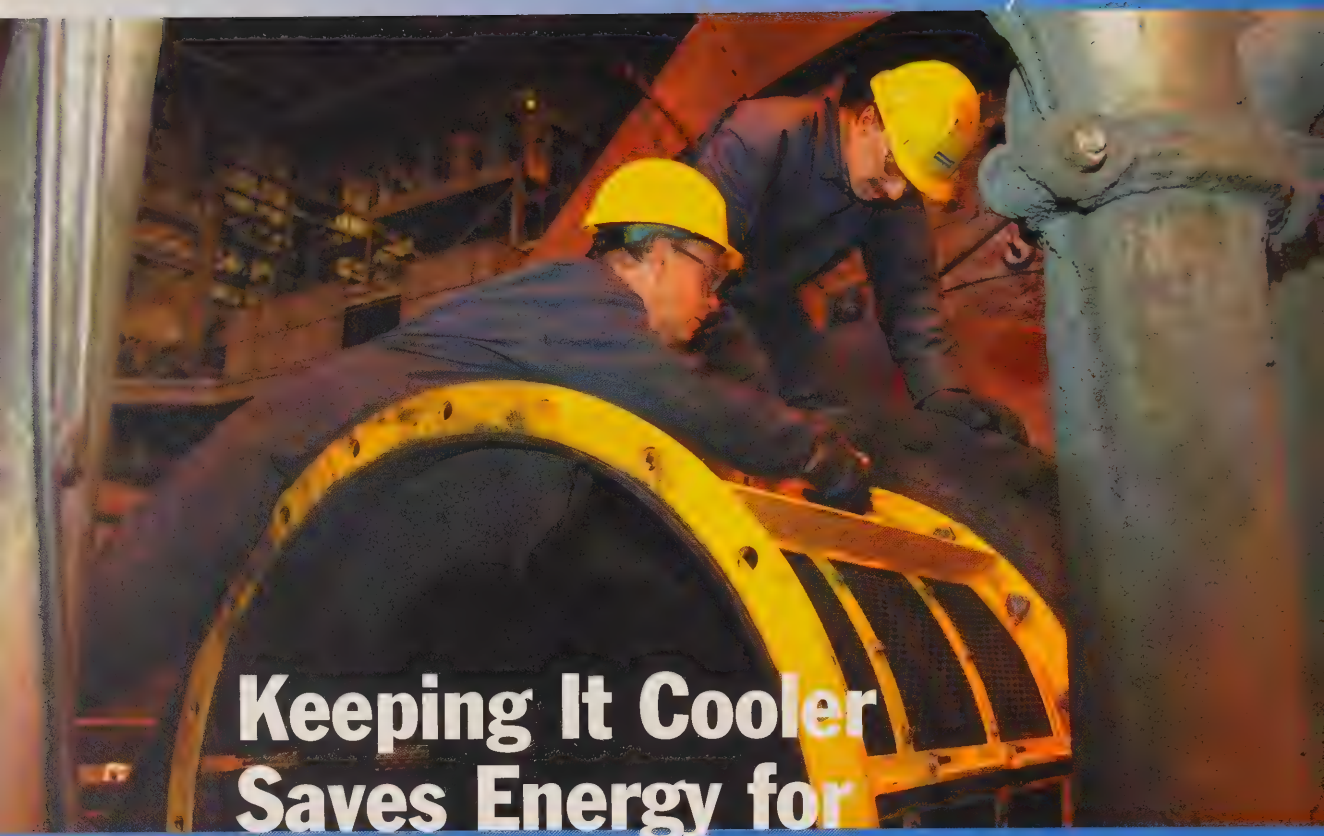
MANAGING ENERGY MORE EFFECTIVELY

Many companies are turning to energy management systems, programs and technologies as a source of energy savings. For example, Ivaco Rolling Mills Inc. installed a predictive "smart" demand-side management system to control electrical energy use at its L'Original, Ontario, steel plant/rolling mill complex. Two years after installation, the system has reduced demand by 9894 kW and saved the company over $846,000 in existing load costs. Over the same period, productivity has risen 8 percent.

An energy efficiency culture pervades the facilities and operations of Imperial Oil Limited. The company has implemented an overall energy management system designed to create performance improvements, and sustains them by making energy performance optimization and improvement a key part of daily work life. A detailed energy performance survey has enabled Imperial to benchmark the operations of its refineries against the company's own best practices, and those of ExxonMobil. The company has used the survey's results to develop a five-year plan for operational and capital improvements at its facilities. These improvements will deepen the already impressive list of energy efficiency successes the company has recorded in recent years.

At the Petro-Canada Lubricants Centre in Mississauga, Ontario, Engineering Specialist and Energy Advisor Tom Latta provides technical support to both

Industrial Energy Innovator Bowater Canadian Forest Products Inc. is committed to energy conservation, increased energy self-sufficiency, greater utilization of biomass and other alternatives to fossil fuels, and opportunities for cogeneration of electricity.



Keeping It Cooler Saves Energy for Iron Ore Company of Canada

Two years of hard work by a project team at Iron Ore Company of Canada have led to an energy efficiency breakthrough. Working on the "Induration Advanced Process Control" project, the team was able to identify ways to lower operating temperatures and pressure variability on the company's induration machines, thereby cutting consumption of Bunker C fuel. Induration machines are horizontal grate furnaces that calcine (harden) iron ore pellets using heat and pressure.

The key to the breakthrough was the installation of an advanced automated process controller which shortens the response lag time inherent in previous controls, allowing for tighter control on operating temperatures and pressures. The new controls have already enabled the company to cut its Bunker C fuel consumption per tonne of product by approximately 6 percent, saving a total of 7 million litres annually and cutting yearly GHG emissions by 22 kilotonnes of carbon dioxide equivalent.

operational and maintenance personnel to help them reduce energy waste and improve efficiency. By bringing a wealth of knowledge resources to the shop floor, and by leading efforts to develop energy efficiency projects at the facility, he has helped the refinery save $3.9 million per year in energy costs and identify another $1 million. His efforts earned him recognition in 2004 as Energy Engineer of the Year by the Association of Energy Engineers.

NorskeCanada, a major North American manufacturer of groundwood printing papers, launched a major energy efficiency and GHG reduction program in the 1990s. By introducing a wide range of changes throughout its operations, the British Columbia company cut its CO_2 emissions between 1990 and 1999 by 30 percent, despite a 12 percent increase in production, and reduced its emissions intensity by 61 percent. Similarly, the energy intensity of the company's mills dropped from 37 gigajoules (GJ)/tonne of product in 1990 to 33 GJ/tonne in 1999. The company estimates that it saved between $20 million and $30 million in the 1990s due to improved energy efficiency.

Raising the Bar

The future of energy efficiency will be driven by new ideas and innovative technologies. This is why companies, industries and governments are investing in concepts that may one day pay huge dividends in energy efficiency.

Montréal, Quebec's Mabarex Inc. believes that it holds one piece of the future's energy puzzle with its newly developed Dry-Rex™ Sludge and Biomass Dryer. This pioneering two-stage system squeezes the liquid out of the waste sludge produced by wood products and paper companies, while at the same time recycling a facility's waste heat. Once dried, process waste becomes a valuable source of fuel. The Dry-Rex™ system is successfully operating in a paper mill and in a high-grade fertilizer factory, improving energy efficiency and reducing waste disposal problems for the facilities.

Researchers at the Canada Centre for Mineral and Energy Technology (CANMET) Mining and Mineral Sciences Laboratories (MMSL) of NRCan have led an initiative to develop an innovative piece of mining equipment that will not only dramatically improve working conditions for underground miners in both Canada and the United States, but will also help mining companies increase their energy efficiency. The CANDRILL is a rock drill that is powered by a high-pressure water system rather than by compressed air. This new rock drill and the system that runs it will significantly reduce the hazards faced by miners, while increasing efficiency.

NRCan and its partners in the Fuelcell Propulsion Institute (FPI) are working on seven projects aimed at bringing fuel cells to underground mining operations. They include a mine locomotive, a test of underground environments on fuel-cell stacks, an underground loader and other key initiatives aimed at demonstrating the safe and economic use of fuel cell technology in underground mines. Fuel cells can help mines to eliminate GHG emissions, lower electrical costs and reduce maintenance.

With an improvement of 25.4 percent since 1990, the Canadian steel industry is already an energy efficiency leader. In recent years, Canadian steelmakers have been working as part of a consortium of 35 partners in 18 countries worldwide to develop ways to reduce the amount of steel used in automobiles. The venture, called the UltraLight Steel Auto Body (ULSAB) project, has developed ways to cut the weight of steel automotive parts while maintaining their strength and affordability.

The Future of energy efficiency will be driven by new ideas

By making vehicles lighter, fuel economy is improved and emissions are reduced. Moreover, using less steel per part manufactured also means less energy used in manufacturing, thereby improving energy intensity.

The steel industry is also using technology such as vacuum degassing, ladle refining and continuous casting to create ultra-formable steels for complex automotive parts and improved electrical steels for electric motors and transformers. These improved steels are resistant to breakage and splitting, even when ultra-thin. New processes have combined to help cut in half, over the past 18 years, the electrical energy consumed by appliances such as blenders, clothes dryers, light timers and refrigerators.

As Canadian industry pursues energy efficiency into the future, ingenuity and innovation will lead the way. Emerging technologies will enable industry to improve efficiency by re-engineering, and even replacing processes with revolutionary new approaches. Bioprocesses such as metabolic engineering, molecular farming, nanotechnology, bioremediation and phytoremediation will enable industry to replace the use of carbon-based energy with biological action. These technologies will be used to convert renewable feedstocks and waste into useful products, to create new biodegradable materials free of petroleum-based feedstocks, and to purify and minimize waste. They will enhance and extend industrial processes, simplify the extraction of materials, synthesize new bioactive ingredients, slash waste and minimize environmental impact.

In the petroleum sector, processing bitumen and other heavy oils using biocatalysis and bioprocessing concepts has the potential to save energy. Compared to current thermochemical technologies, bio-based technologies have the potential to reduce the viscosity of heavy oil at lower temperatures and pressures. The technology, now being researched by several Canadian organizations including the University of Alberta, also applies to other sectors. The technology can be used to provide substitute materials and feedstocks, reduce energy consumption and slash waste in the chemical and plastics industry. Mining companies might be able to replace high temperature roasting and smelting with ambient temperature bioleaching biooxidation. The pulp and paper industry could draw upon bioprocesses for de-inking and bleaching, and to reduce water use.

By taking comprehensive action to improve processes, systems and practices, Canadian industry has made substantial progress in reducing energy intensity. But energy efficiency still holds immense potential. Efficient leading-edge technologies will bring industries a new array of tools to advance energy efficiency, improve their operations and reduce costs.

Energy Saved Is Profit Gained at Devon Canada

Major western Canada natural gas and crude oil producer Devon Canada Corporation sees energy efficiency as key to improving its bottom line. Employing a multi-faceted energy and emissions management policy, Devon Canada focuses on minimizing the consumption of electrical energy, improving fuel economy, cutting losses of saleable products and reducing volumes of flared and vented gas.

The company made one of its most impressive advances in its Lloydminster and Medicine Hat fields in Alberta/Saskatchewan, where it now captures vent gas for fuel use and sale. The project enabled Devon Canada to divert 57.3 million cubic metres of vent gas and reduce CO_2 emissions by 674 kilotonnes in 2003.

By implementing hundreds of energy reduction and emission reduction projects, Devon Canada has successfully reduced greenhouse gas emissions year after year since 1994. Moreover, compared to a business-as-usual baseline, Devon estimates that it has cut emissions by 28 percent from the business-as-usual emissions level or 1370 kilotonnes of carbon dioxide equivalent over the same period.

Industrial Energy Innovator Iron Ore Company of Canada reduced Bunker C fuel consumption by 7 million litres per year by investing in advanced control equipment.

Performance

Canadian industry has significantly

advanced Canada's sustainable development agenda by rallying around the CIPEC banner to improve energy intensity and slash GHG emissions. While making these gains, industry sectors have also lowered production costs and improved process efficiency. When clear vision and decisive action meet, the result is performance.

THE CIPEC TOOLBOX

CIPEC's first 30 years are notable for the organization's remarkable consistency, and its unflagging dynamism, resiliency and ability to advocate energy efficiency as a means to a constantly changing end. CIPEC's continuing relevance is revealed in its impressive growth. From a handful of industry participants in 1975, CIPEC has grown, evolved and adapted to changing times and circumstances to where it now encompasses 26 task forces led by 48 trade organizations representing more than 5000 industrial firms from the mining, construction, manufacturing and energy supply sectors. As of today, these firms represent nearly 98 percent of Canada's secondary industrial energy consumption.

CIPEC helps companies to make intelligent energy management and investment decisions with an array of programs and tools geared to their needs. For example, energy benchmarking enables companies to compare their energy efficiency performance against "best practices" facilities in their sectors. This comparative analysis approach to gauging energy performance helps companies focus their efforts on opportunities to reduce energy consumption. Committed to the merits of energy performance benchmarking, CIPEC works in step with trade associations primarily by providing expertise and financial support.

Since the CIPEC benchmarking program was launched in 2001, studies have been carried out within 14 different industrial sectors representing 265 companies. As well, some of the early participants are returning to re-examine their improvement. These studies are beginning to show significant results, as companies renew their efforts to keep their energy management practices in line with world-class practices.

CIPEC's highly popular energy audits help industrial facilities to identify areas of energy waste, and develop priorities to eliminate them. The energy audit program was introduced in 2001. As of March 31, 2004, 247 audits have been carried out, 142 of them in fiscal year 2003/2004 alone. Facilities examined in these audits represent combined energy expenditures of nearly $1 billion per year.

CIPEC's audit program is expanding. In a new process integration pilot program supported by NRCan, a team of engineers and energy experts rigorously and systematically identify the most effective and efficient energy-saving opportunities in complex industrial processes. This new form of audit digs deeper to examine the interaction of multiple processes, and find sophisticated structural energy efficiency opportunities. The process integration audit gives decision makers the detailed information they need to invest confidently in energy- and material-saving projects.

Putting a Lid on Energy Costs at Procter & Gamble

For close to 20 years, Procter & Gamble [illegible] efficiency opportunities. But it wasn't until [illegible] five years ago that the company began [illegible] the plant has implemented a variety of [illegible] GHG reduction team. The GHG team [illegible] is a member of the company's energy management team. [illegible] teamers such as [illegible] on the shop floor.

Procter & Gamble's (P&G's) team approach [illegible] of which 50 were adopted. For example, [illegible] savings of $168,000, replacing water chiller [illegible] off lighting in over 8 areas added another $72,000 [illegible] energy efficiency efforts. P&G Shreveport [illegible] by 10.0 percent in the 3rd quarter of 2003 [illegible] 8.5 percent total by mission end in 2006–2007. [illegible]

CIPEC encompasses
98 Percent
of Canada's secondary industrial energy use

One of CIPEC's basic, yet most effective, tools is its highly popular Dollars to $ense workshops. Since these sessions were introduced in 1997, more than 1700 industrial participants have been introduced to the fundamentals of energy management specific to their industries and their companies. By opening people's eyes to the opportunities for energy efficiency in their facilities, these workshops are an inexpensive way for companies to get employees thinking and participating. In 2003, for example, one employee attending a Dollars to $ense workshop identified an opportunity to reduce energy consumption that immediately saved his company $45,000 per day. According to an evaluation study, the Dollars to $ense workshops are having a sizable impact on Canada's industrial energy use, as well as contributing to corporate competitiveness. According to the study, Dollars to $ense participants have avoided energy costs totaling $32 million since 1997.

CIPEC continues to communicate to thousands of individuals in hundreds of companies through its informative *Heads Up CIPEC* newsletter. Published bi-weekly and distributed electronically, *Heads Up CIPEC* keeps Canada's industrial energy efficiency community informed about technological innovations, CIPEC programs, and company actions which contribute to energy efficiency. In addition, CIPEC's Energy Managers Network provides a forum for discussion and information sharing which serves energy managers across Canada. Network members communicate through plant meetings, as well as through the network's Web site at www.oee.nrcan.gc.ca/cipec/ieep/emn.

Road Map for the Future

Not content with the status quo, CIPEC continues to seek out ways to expand the scope and improve the effectiveness of its programs. At a workshop held in March 2004, the CIPEC Executive Board and Task Force Council addressed the challenge of increasing investment in energy efficiency by launching a financing road map. They concluded that many business decision makers are still unaware of the energy savings that are available in their firms – millions of dollars in low-hanging fruit waiting to be picked in the industrial sector alone. Despite the obvious opportunities, energy efficiency investment is generally outranked by competing priorities for capital.

An action plan composed of two themes emerged from the workshop: access to capital, and access to information.

Industry needs readily accessible information about the financing of energy management projects, as well as help to overcome financial hurdles. Workshop participants agreed that a task force is needed to investigate the feasibility of establishing a public-private financing organization to make energy efficiency investment capital more accessible.

Participants also recommended that an information clearing house be established to improve industry awareness and to educate companies, especially small and medium-sized establishments, about energy management and financing options and opportunities. They also stated that governments should establish energy efficiency incentives which target the uptake of proven, effective technologies, with fewer incentives earmarked toward funding research and development.

CIPEC is also pursuing an increasingly active outreach program to build relationships with industry organizations currently outside of the CIPEC family. The program seeks to extend the organization's reach across the country, and to engage the vast numbers of small enterprises which operate in nearly every industrial sector.

WHAT THE NUMBERS SAY ABOUT 2003

In 2003, CIPEC industries contributed almost $289 billion to the Canadian economy, about 28 percent of the country's gross domestic product (GDP), and provided more than 20 percent of Canada's jobs.

CIPEC's importance is reflected in the tangible results achieved by Canadian industry.

While Canada's GDP rose 36 percent between 1990 and 2003, thanks to energy management measures, industrial energy consumption rose only 23.8 percent.

As a result of CIPEC's efforts, the more than 5000 companies that represent over 98 percent of Canadian industry have reduced their combined energy intensity by 8.7 percent between 1990 and 2003, or an average of 0.7 percent per year. Improved energy management enabled Canadian industry to avoid approximately $3.4 billion in purchased energy in 2003, enough energy to heat 4.8 million Canadian households for one year. Had energy intensity remained constant, industry's GHG emissions would have been 27.8 megatonnes higher.

The mining, manufacturing and construction sectors improved their energy intensity by an average of 1.7 percent per year over that period, with an accompanying 1.1 percent annual improvement in energy efficiency. In 2000, these CIPEC sectors made a public voluntary commitment to achieve an average energy intensity improvement of 1 percent per year for the years 1990 to 2005.

The energy management actions of CIPEC industries contributed significantly to the Canadian economy. In 2002, just over 40 percent of the $1.1-billion investment made by industry in the reduction of GHG emissions went to the suppliers and manufacturers of Canadian equipment.

JUST THE BEGINNING

CIPEC has remained a vital industrial energy efficiency resource for three decades. It has done so because the unique public-private sector partnership has been able to embrace new ideas and evolve to meet a rapidly changing worldwide energy environment.

The challenges facing industry have never been greater. The worldwide demand for energy supplies is growing at the same time as the world's conventional reserves have reached, or passed, their peak production capacity. Over the long term, these trends will force energy prices upward. At the same time, Canada's commitment to reduce GHG emissions requires industry to implement more comprehensive emissions-focused programs and practices. In this demanding environment, Canadian industry has little choice but to increase its investment in energy-efficient technologies and focus more attention on energy management.

Fortunately, CIPEC is available to help. The organization's unparalleled toolbox brings effective, advanced energy management tools to the table – encouraging the development and implementation of new technologies, spreading information about new ideas and best practices, and providing mentoring and networking opportunities for industrial organizations of all sizes.

The first thirty years of achievement form a solid foundation on which industry will build even greater energy efficiency as Canada continues to journey into the future.

Over the last several years, Industrial Energy Innovator Imperial Oil Limited has invested in energy efficiency including furnace air preheaters, innovative energy efficient hydrotreating technology to produce low sulphur motor gasoline fuels and $250 million to build two cogeneration facilities, one at Cold Lake and the other at its Sarnia site. Together, the two facilities have the capacity to produce 265 megawatts of electric power.

Sector Reports

Aluminum

Profile

Canada's aluminum sector is one of the world's leaders in aluminum production. The combined output of the industry's plants in the provinces of Quebec and British Columbia makes a major contribution to Canada's national and local economies.

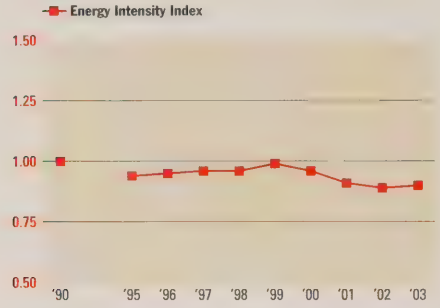
Achievements

Primary aluminum production increased by 78 percent between 1990 and 2003, while energy consumption over this period increased by 61 percent. The increase in energy consumption to 176 385 TJ in 2003 was largely due to a 62.5 percent increase in electricity use. Energy intensity improved by 10 percent from 1990 to 2003, but increased slightly (1 percent) between 2002 and 2003.

Aluminum Sector – NAICS 331313

Energy Intensity Index (1990–2003)

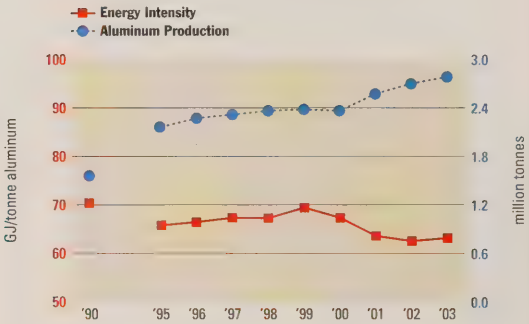
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Aluminum Sector – NAICS 331313

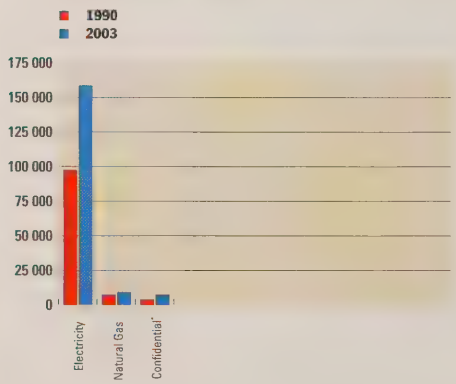
Energy Intensity and Physical Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Aluminum Sector – NAICS 331313

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

* Confidential data include: LFO (Middle Distillates), HFO (Heavy Fuel Oil) and LPG (Propane).

Brewery

Profile

The Canadian brewing industry prides itself on its world-class beers, its leadership in educating consumers to drink responsibly, its three-century history in Canada, its diversity and its impressive environmental record.

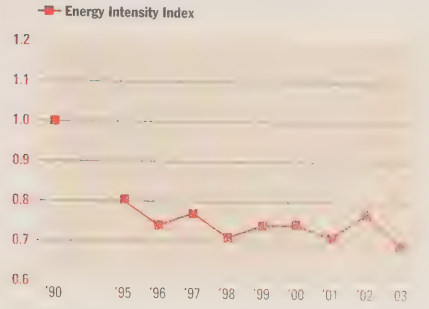
Achievements

Compared with 1990, the industry now uses 31 percent less energy to produce a hectolitre of beer. In 2003, the industry consumed 5568 TJ of energy, 59 percent of which was natural gas and 26 percent electricity. The brewing industry is committed to an energy reduction target of 1.5 percent annually from 2004 through 2006.

Brewery Sector – NAICS 312120

Energy Intensity Index (1990–2003)

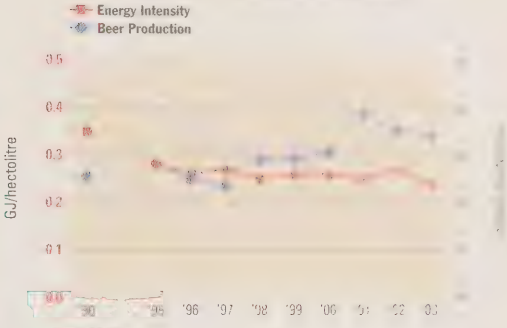
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003 December 23, 2004 Simon Fraser University

Brewery Sector – NAICS 312120

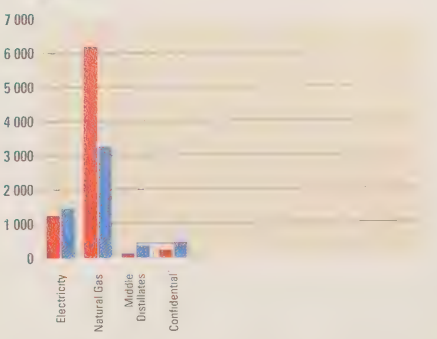
Energy Intensity and Physical Output 1990–



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003 December 23, 2004 Simon Fraser University

Brewery Sector – NAICS 312120

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. December 23, 2004. Simon Fraser University.

• Confidential data include: HFO (Heavy Fuel Oil), LPG (Propane) and Steam.

Cement

Profile

The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments.

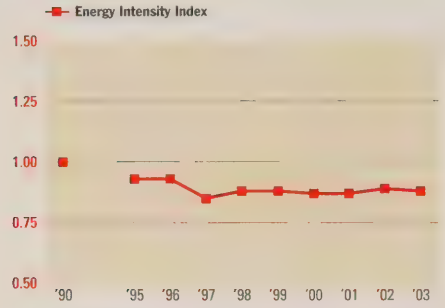
Achievements

The cement industry produced 13.2 million tonnes of clinker in 2003. This represents a 25.4 percent increase in production since 1990. Over the same period, energy consumption increased by only 10.2 percent to 65 006 TJ. Energy intensity, however, decreased by 12 percent from 5.61 to 4.93 GJ/tonne clinker. Since 1998, the energy used by the industry to produce a tonne of clinker has been fairly level, with slight increases in some years and very minor decreases in others.

Cement Sector – NAICS 327310

Energy Intensity Index (1990–2003)

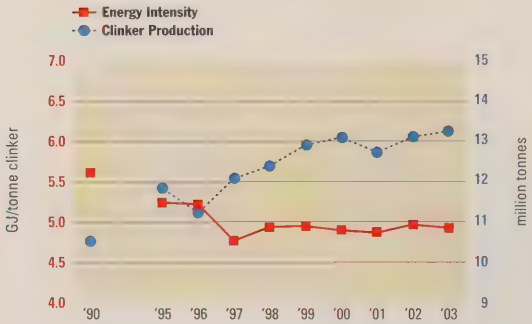
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Cement Sector – NAICS 327310

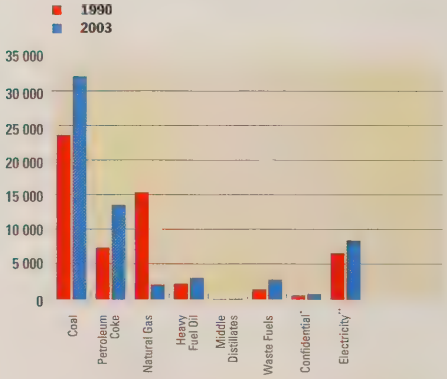
Energy Intensity and Physical Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Cement Sector – NAICS 327310

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

* Confidential data include: LPG (Propane), Coal Coke, and Wood Waste.

** Note: 2003 data are preliminary. Electricity data reported by ICE/CIEEDAC seem high given the marginal increase in production. The production of a tonne of cement requires an amount of electricity that generally does not vary much and cannot be substituted with another source of energy. These data will be subject to further validation.

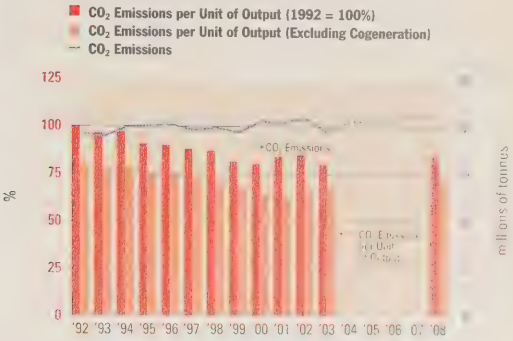
Chemical

Profile

The chemical sector encompasses a diverse industry that produces organic and inorganic chemicals, plastics and synthetic resins. The Canadian Chemical Producers' Association (CCPA) is the trade association that represents manufacturers in this sector. Its member companies produce more than 90 percent of industrial chemicals manufactured in Canada.

Chemical Sector – NAICS 3251, 3252

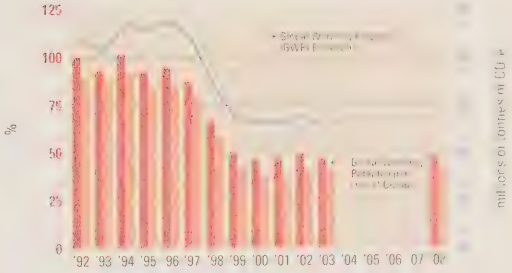
Carbon Dioxide Emissions versus Product Output



Data source:
Data provided by CCPA member operations

Chemical Sector – NAICS 3251, 3252

Global Warming Potential versus Product Output



Data source:
Data provided by CCPA member operations

Achievements

The chemical sector's product output has increased nearly 26 percent since 1992. At the same time, total CO_2 emissions from CCPA members from 1992 to 2003 have increased by 0.7 percent and, in terms of global warming potential, member companies' GHG emissions – millions of tonnes of CO_2e emissions – in 2003 have declined by 41 percent compared to 1992 amounts.

Construction

Profile

The construction sector is arguably Canada's largest industry, comprising a diverse array of companies whose work touches every economic sector and region of the country.

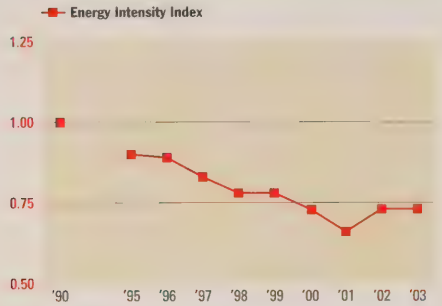
Achievements

The construction industry's energy consumption is directly related to levels of construction activity. The industry recorded an increase in gross output in 2003 of 4 percent compared to 2002. Since 1990, this sector has reduced energy consumption; however in 2003, energy consumption was 56 718 TJ, a nine-year high. Energy intensity has improved 27 percent between 1990 and 2003, but improvements since 2000 have been less than 1 percent.

* NAICS 236 includes buildings, NAICS 237 includes heavy and civil engineering construction, and NAICS 238 includes specialty trade contractors

Construction Sector – NAICS 230000*

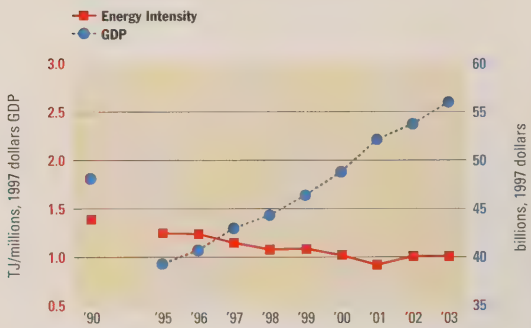
Energy Intensity Index (excluding electricity) (1990–2003)
Base Year 1990 = 1.00



Data source:
Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2003.* November 2004. Informetrica Limited, *Construction Industry Tables: 1981–2025,* November 2004. Prepared for the Canadian Construction Association.

Construction Sector – NAICS 230000*

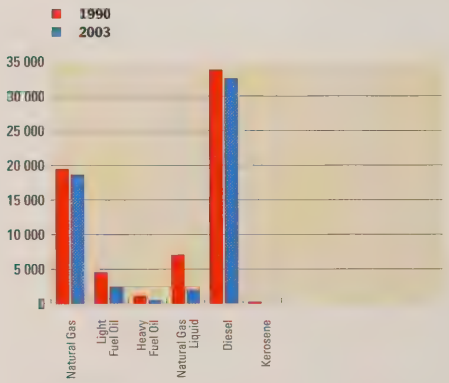
Energy Intensity and Economic Output (excluding electricity) (1990–2003)



Data source:
Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2003.* November 2004. Informetrica Limited, *Construction Industry Tables: 1981–2025,* November 2004. Prepared for the Canadian Construction Association.

Construction Sector – NAICS 230000*

Energy Sources in Terajoules per Year (excluding electricity) (TJ/yr)



Data source:
Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2003.* November 2004. Informetrica Limited, *Construction Industry Tables: 1981–2025,* November 2004. Prepared for the Canadian Construction Association.

Dairy

Profile

Canada's dairy product manufacturing sector spans Canada from coast to coast, operating facilities and employing people across the country.

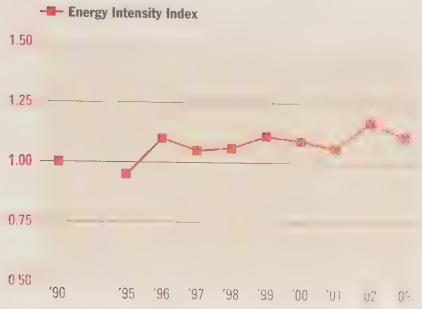
Achievements

In 2003, Canada's dairies produced 70.1 million hectolitres of milk and cream, about 4.5 percent less than in 1990. Between 1990 and 2003, energy intensity in the dairy sector has increased by 11 percent. In 2003, compared to 2002, however, there has been over 5 percent less energy used to produce a hectolitre of milk and cream, while production actually increased 3.5 percent.

Dairy Sector – NAICS 311500

Energy Intensity Index (1990–2003)

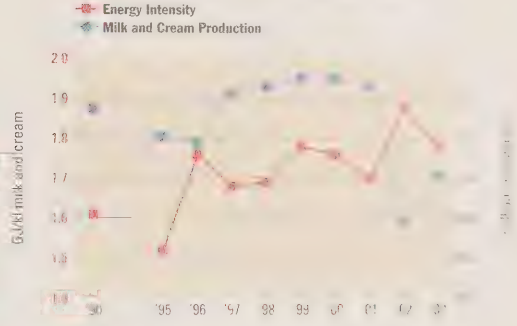
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University

Dairy Sector – NAICS 311500

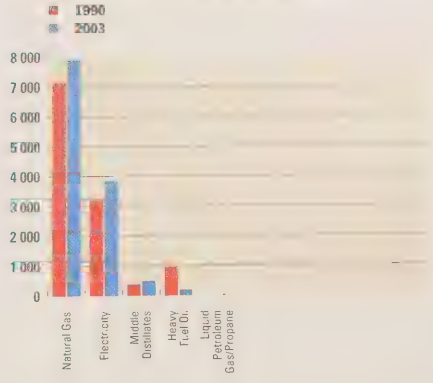
Energy Intensity and Physical Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University

Dairy Sector – NAICS 311500

Energy Sources in Terajoules per Year (TJ/y)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University

Electrical and Electronics

Profile

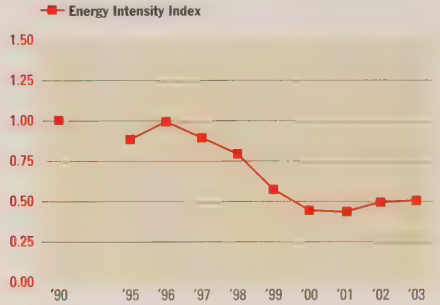
The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communications and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. The industry is a major exporter and a vital, growing contributor to the national economy.

Achievements

In nearly equal proportions, natural gas, electricity and a combination of heavy fuel oil, middle distillates and propane satisfy virtually all of the electrical and electronics industry's energy requirements. In 2003, the industry consumed 11 542 TJ of energy, nearly the same as in the previous two years. Between 1990 and the end of 2003, the sector's overall energy consumption decreased despite substantial growth in production. These factors have combined to decrease energy intensity by nearly 51 percent over this period. Since 2000, however, energy intensity has risen about 12.5 percent while production has dropped materially.

Electrical and Electronics Sector – NAICS 334335

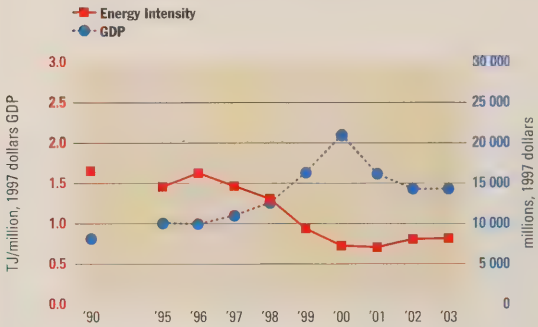
Energy Intensity Index (1990–2003)
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Electrical and Electronics Sector – NAICS 334335

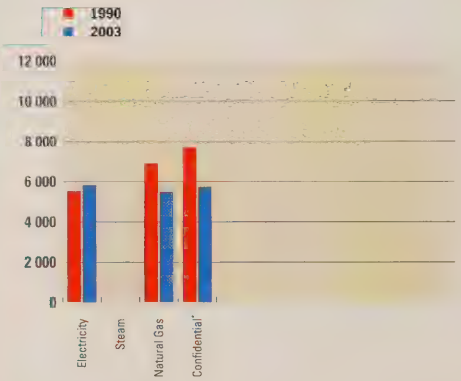
Energy Intensity and Economic Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Electrical and Electronics Sector – NAICS 334335

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

* Confidential data include: HFO (Heavy Fuel Oil), LFO (Middle Distillates) and LPG (Propane).

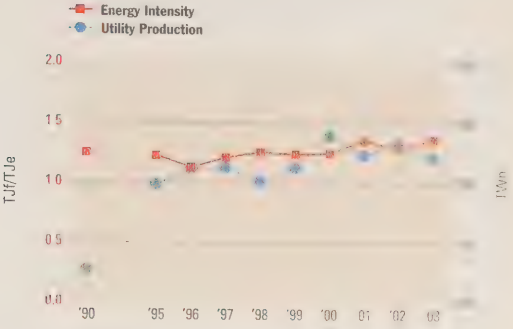
Electricity Generation

Profile

The electricity generation sector produces the electrical energy that powers industries, businesses and homes across Canada.

Electricity Generation Sector – NAICS 22111

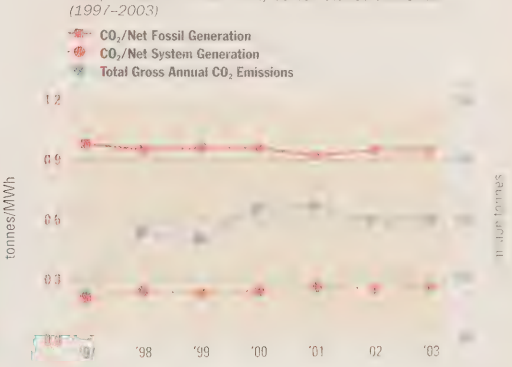
Utility Production and Energy Intensity (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *A Review of Energy Consumption and Production Data for the Electricity Generation Industry 1990–2003*. January 2005.

Electricity Generation Sector – NAICS 22111

Utility Production versus Utility Carbon Dioxide Emissions (1997–2003)



Data source:
Canadian Electricity Association – Environmental Commitment and Responsibility (ECR) Program 1997–2003. *2003 ECR Annual Report.*

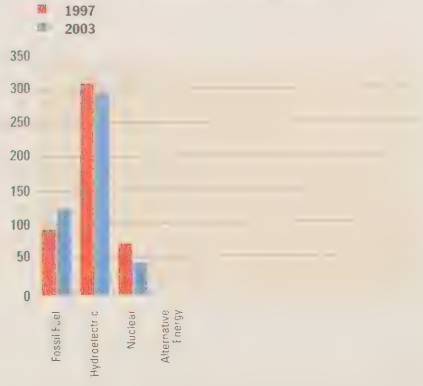
Achievements

Using water, fossil fuel, nuclear energy and alternative energy sources, the sector produced 521 TWh in 2003. This represents a 22 percent increase in generation since 1990. Over the same time frame, energy intensity in this sector increased 9.7 percent. This reflects a 31 percent increase in the contribution to net generation from fossil fuel sources since 1997, and material decreases in hydroelectric and nuclear generation over the same period.

The gross annual CO_2 emissions and CO_2 emissions intensity (CO_2/Net System Generation) have also risen since 1997, by 26.3 percent and 30 percent respectively. However, the CO_2 emissions intensity for fossil fuel generation production has improved.

Electricity Generation Sector – NAICS 22111

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Electricity Association – Environmental Commitment and Responsibility (ECR) Program 1997–2003. *2003 ECR Annual Report.*

Fertilizer

Profile

Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers.

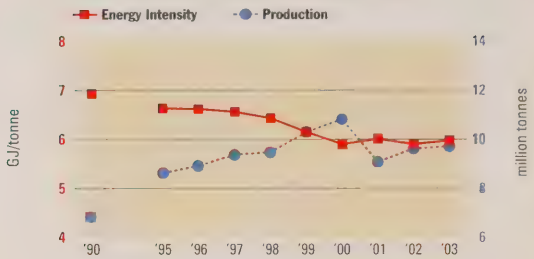
Achievements

The Canadian fertilizer sector ranks among the lowest GHG emitters per unit of fertilizer output in the world. According to the Canadian Industrial Energy End-Use Data and Analysis Centre's (CIEEDAC's) and the Canadian Fertilizer Institute's (CFI's) production statistics, nitrogen fertilizer production (gross) increased from 6.8 million tonnes in 1990 to 9.7 million tonnes in 2003. Natural gas consumed as fuel – and other fuel sources used for this production – totalled 57 885 TJ in 2003, versus 47 186 TJ in 1990. This represents an improvement in fuel energy efficiency of approximately 14 percent over the 13-year period.

Since 1990, potash production has increased 31 percent, totalling 9.1 million tonnes in 2003. Overall, energy indicators show an improvement in energy intensity averaging more than 1 percent per year since 1990.

Nitrogenous Fertilizer – NAICS 325313

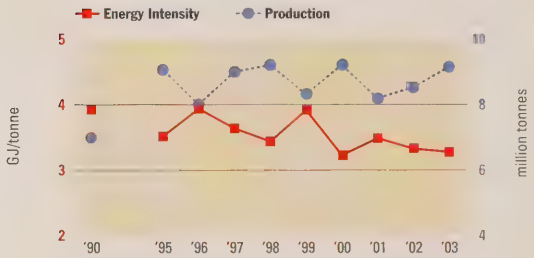
Energy Intensity and Physical Output (1990–2003)



Data source: Canadian Fertilizer Institute (CFI), January 2005.

Potash – NAICS 212396

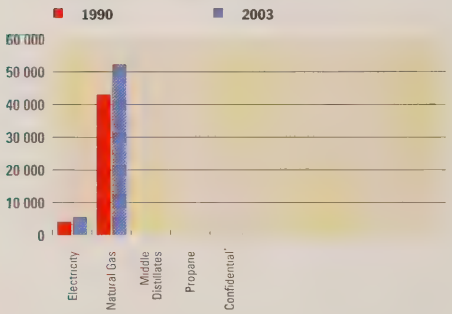
Energy Intensity and Physical Output (1990–2003)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Nitrogenous Fertilizer – NAICS 325313

Energy Sources in Terajoules per Year (TJ/yr)

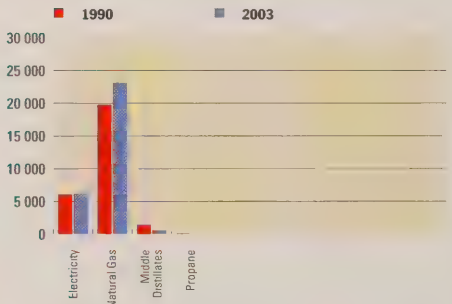


Data source:
(1) Natural Gas – 1990–2003, CFI, February 2004.
(2) Other Fuels 1990–2003. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

* Confidential data include: HFO (Heavy Fuel Oil) and Steam.

Potash – NAICS 212396

Energy Sources in Terajoules per Year (TJ/yr)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Food and Beverage

Profile

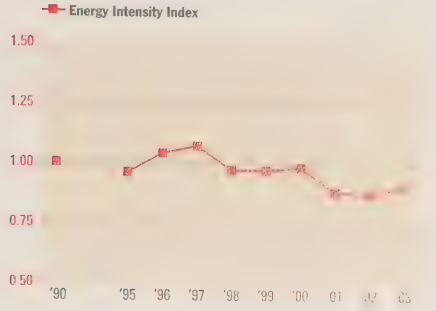
Canada's food and beverage sector includes manufacturers that produce a diverse range of products, including meat, poultry, fish, fruit and vegetables, flour and bakery products, oils and sugars, coffee, snack foods, soft drinks and confections.

Achievements

Canada's food processing industry continued to increase its gross output in 2003, and its energy use actually increased slightly in 2003 compared with the previous year. The sector's total energy consumption rose to 108 520 TJ in 2003 compared with 107 295 TJ in 2002 – an increase of 1.1 percent. Over the past 13 years, the sector's total energy consumption increased by 14.2 percent, from 95 001 TJ in 1990, due largely to a significant increase in electricity consumption. The food industry has made long-term progress toward better energy efficiency. From 1990 to 2003, food processors improved their collective energy intensity by 10.4 percent.

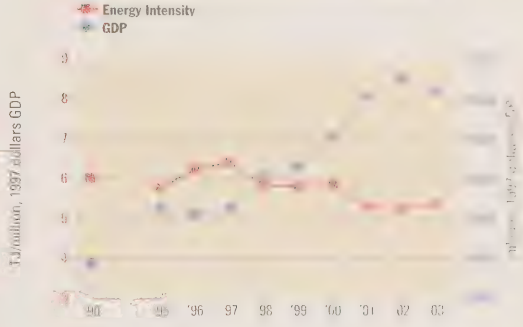
* NAICS 311000 – Food manufacturing
NAICS 312100 – Beverage and Tobacco Product Manufacturing, Beverage Product Manufacturing

Food and Beverage Sector – NAICS 311000, 312100
Energy Intensity Index (1990–2003)
Base Year 1990 = 1.00



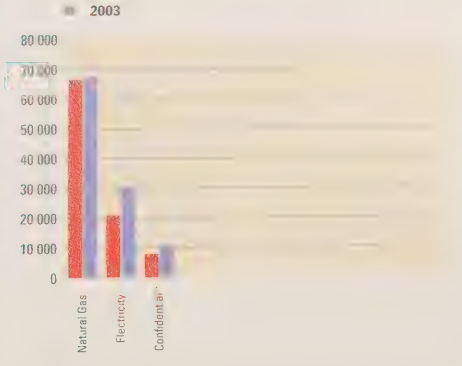
Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. December 23, 2004. Simon Fraser University.

Food and Beverage Sector – NAICS 311000, 312100
Energy Intensity and Economic Output (1990–2003)



Data source
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. December 23, 2004. Simon Fraser University.

Food and Beverage Sector – NAICS 311000, 312100
Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. December 23, 2004. Simon Fraser University.

** Confidential data include: HFO (Heavy Fuel Oil), LFO (Middle Distillates), LPG (Propane), Steam and Wood.

Foundry

Profile

Metal castings are the first step in the value-added manufacturing chain and are utilized in the manufacture of most durable goods. Markets and industries served by foundries include the automotive sector, construction, agriculture, forestry, mining, pulp and paper, heavy industrial machinery and equipment, aircraft and aerospace, plumbing, soil pipe, municipal road castings, defence, railway, petroleum and petrochemical, electricity distribution and a myriad of specialty markets.

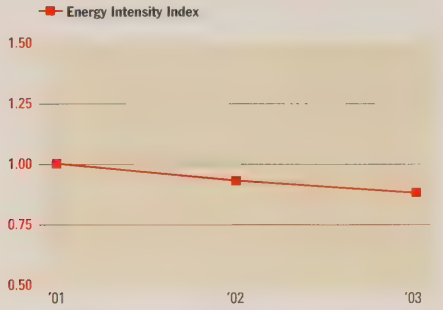
Achievements

Canada's foundries no longer use GHG-generating fuels such as coal, oil or coke in their operations, and they have eliminated the use of steam produced by coal-generated electricity. Escalating oil, natural gas and power costs as well as a rising Canadian dollar are motivating companies to undertake energy efficiency activities such as installing more efficient equipment, adopting better production methods, fuel switching and establishing waste-energy capture programs.

Since 2001, the foundries have reduced energy intensity by nearly 12 percent while production has increased by 15.4 percent.

Foundry Sector – NAICS 331500

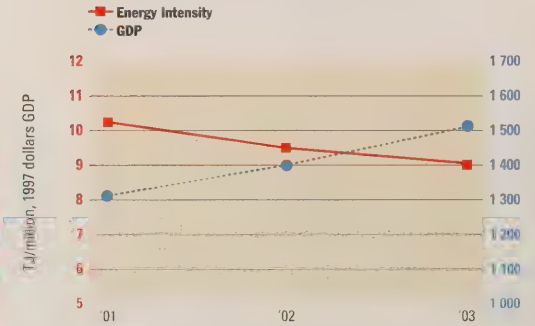
Energy Intensity Index (2001–2003)
Base Year 2001 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Foundry Sector – NAICS 331500

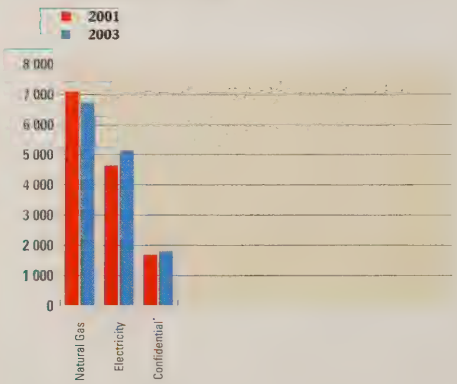
Energy Intensity and Economic Output (2001–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Foundry Sector – NAICS 331500

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

* Confidential data include: HFO (Heavy Fuel Oil), LFO (Middle Distillates), LPG (Propane), and Coal Coke.

General Manufacturing

Profile

The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing activities, construction materials, floor coverings, insulation, glass and glass products, adhesives, plastics and pharmaceuticals. The sector encompasses approximately 2000 small, medium and large companies that, combined, consumed 210 039 TJ of energy in 2003.

Achievements

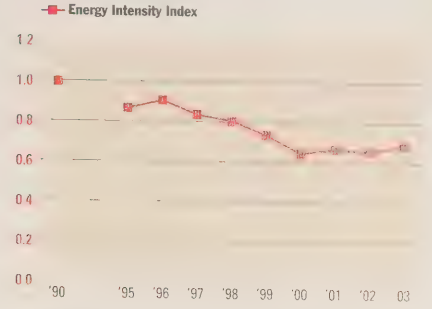
The sector's production has grown 52.9 percent between 1990 and 2003. At the same time, energy intensity has fallen by 31.4 percent over this period. The lowest energy intensity, 3.0 TJ/million 1997 dollars, was achieved in 2000 and since that time energy intensity appears to be rising marginally again.

* NAICS Category Name

Leather & Allied Product	NAICS 316
Clothing & Manufacturing	NAICS 315
Furniture & Related Product	NAICS 337
Printing & Related Support Activities	NAICS 323
Fabricated Metal Product	NAICS 332
Machinery	NAICS 333
Non-metallic Mineral Product not Elsewhere Classified	NAICS 3271, 3272, 32732, 32733, 32739, 32742, 3279
Miscellaneous Manufacturing	NAICS 339
Chemical Manufacturing not Elsewhere Classified	NAICS 32522, 325314, 32532, 3254, 3255, 3256, 3259
Tobacco Product Manufacturing	NAICS 3122
Converted Paper Product Manufacturing	NAICS 3222
Plastic Products	NAICS 3261

General Manufacturing Sector*

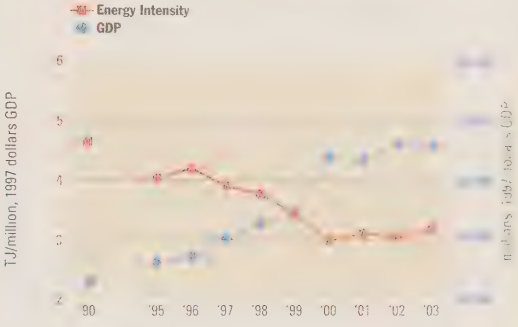
Energy Intensity Index (1990–2003)
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

General Manufacturing Sector*

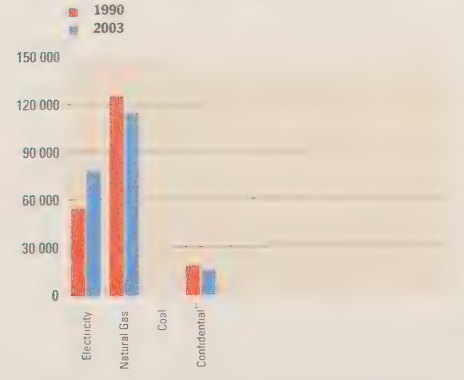
Energy Intensity and Economic Output (1990–20[illegible])



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

General Manufacturing Sector*

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

** Confidential data include: Coke, Petroleum, HFO (Heavy Fuel Oil), LPG (Propane), LFO (Middle Distillates), Steam, Wood Waste and Pulping Liquor.

Lime

Profile

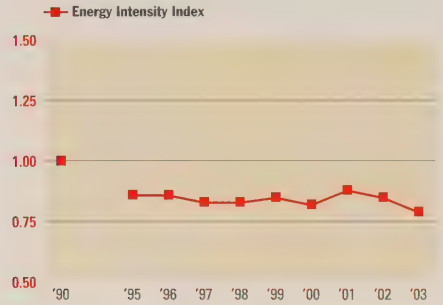
Canada's merchant lime sector supplies essential raw materials for the steel and mining industry, the pulp and paper industry, water treatment, environmental management and other basic industries.

Achievements

Companies in the merchant lime sector represented by the Canadian Lime Institute continue to work actively to improve the energy efficiency of their operations. According to energy data available in 2003, it took 13 642 TJ of energy to produce 2050 kilotonnes of lime. This compares with 14 813 TJ and 2073 kilotonnes in 2002 and 15 526 TJ and 1848 kilotonnes in 1990. Total energy consumption decreased by 1884 TJ between 1990 and 2003, and energy intensity decreased by 20.7 percent.

Lime Sector – NAICS 327410

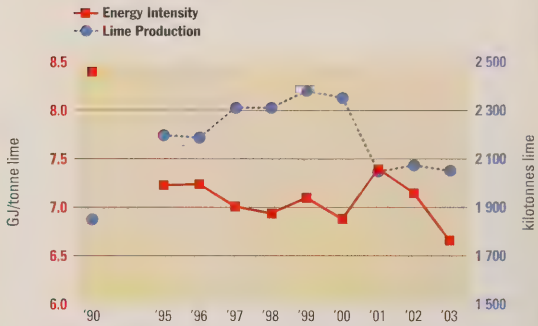
Energy Intensity Index (1990–2003)
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

Lime Sector – NAICS 327410

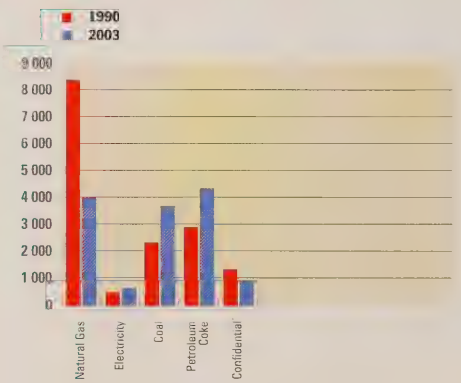
Energy Intensity and Physical Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

Lime Sector – NAICS 327410

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

* Confidential data include: HFO (Heavy Fuel Oil), LFO (Middle Distillates), LPG (Propane) and Coal Coke.

Mining

Profile

Canada's minerals and metals industry produces scores of different mineral commodities for domestic and export markets in facilities located across the country.

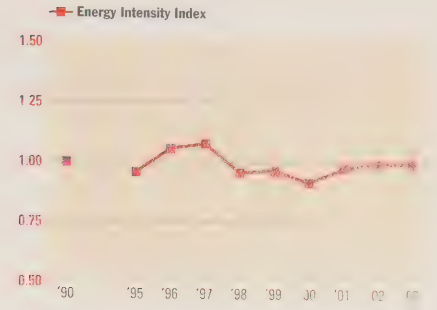
Achievements

Canadian metal ore production has fallen from 282 million tonnes in 1990 to 228 million tonnes in 2003, a decrease of 19.2 percent. Energy consumption over this period has fallen by a very similar percentage (19.4) to 81 537 TJ in 2003. The industry's energy intensity has remained fairly level throughout the 13 years and is the same in 2003 as it was in 1990.

Metal Ore Mining Sector – NAICS 212200

Energy Intensity Index (1990–2003)

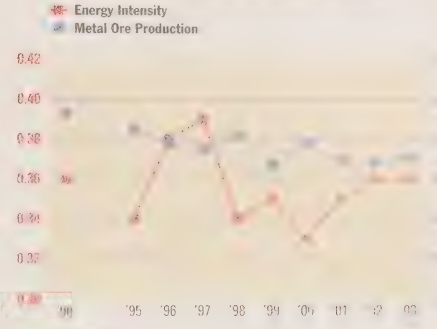
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. January 1, 2005. Simon Fraser University.

Metal Ore Mining Sector – NAICS 212200

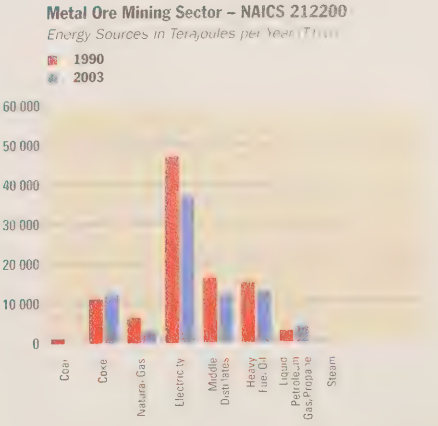
Energy Intensity and Physical Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. January 1, 2005. Simon Fraser University.

Metal Ore Mining Sector – NAICS 212200

Energy Sources in Terajoules per Year (TJ)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC)
Development of Energy Intensity Indicators for Canadian Industry 1990–2003. January 1, 2005. Simon Fraser University.

Oil Sands

Profile

Canada's oil sands sector includes several plants in northern Alberta and one heavy oil upgrader in Saskatchewan. The sector is a major employer and a significant contributor to Canada's exports and GDP.

Achievements

Data for 2003 is not available. In 2001, the last reporting year, energy consumed per unit of production rose slightly to 8.89 GJ/m^3 compared with 8.84 GJ/m^3 in 2000.

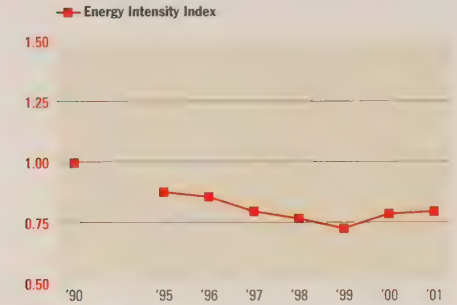
In 2001, the sector's total annual production rose 95 percent since 1990 but its energy use rose only 56 percent.

In 2001, the sector's energy consumption totalled 207 335 TJ, and its energy intensity has improved by a total of 20 percent since 1990.

Oil Sands Sector – NAICS 211114

Energy Intensity Index (1990, 1995–2001)

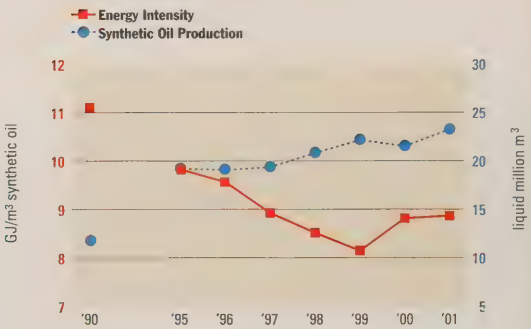
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Oil Sands Sector – NAICS 211114

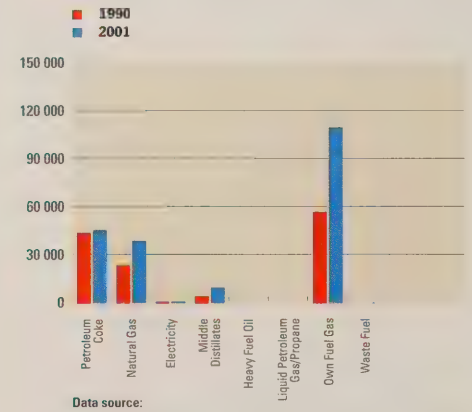
Energy Intensity and Physical Output (1990–2001)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Oil Sands Sector – NAICS 211114

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Petroleum Products

Profile

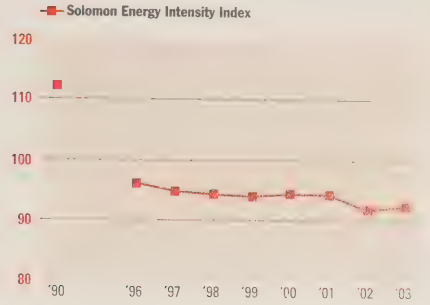
Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, and other related products through a network of approximately 15 000 wholesale and retail outlets nationwide.

Achievements

Since the 1990 base year, the petroleum products sector's total energy consumption has increased slightly by 3.8 percent to 300 PJ LHV (lower heating value). Production over the same period increased by 20.9 percent. In 2003, the sector's energy intensity index stood at 93.0 – a 0.6 percent increase over 2002 and a 17.4 percent better level of efficiency than in 1990.

Petroleum Products Sector – NAICS 324110

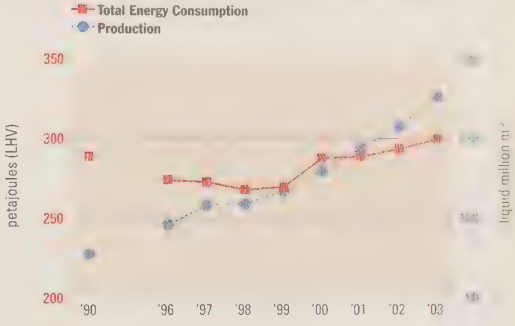
Solomon Energy Intensity Index (1990, 1996–2003)
Base Year 1990 = 112.6



Data source:
Review of Energy Consumption in Canadian Oil Refineries and Upgraders 1990, 1995 to 2003. Prepared for the Canadian Petroleum Products Institute (CPPI) and Canadian Industry Program for Energy Conservation by John Nyboer, Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). January 2005. Simon Fraser University

Petroleum Products Sector – NAICS 324110

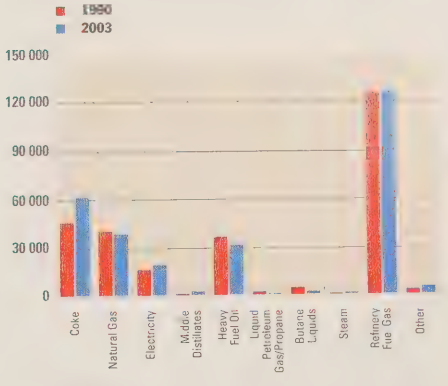
Production and Energy Consumption (1990, 1996-2003



Data source:
Review of Energy Consumption in Canadian Oil Refineries and Upgraders 1990, 1995 to 2003. Prepared for the Canadian Petroleum Products Institute (CPPI) and Canadian Industry Program for Energy Conservation by John Nyboer, Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). January 2005. Simon Fraser University

Petroleum Products Sector – NAICS 324110

Energy Sources in Terajoules per Year (TJ/yr) (LHV)



Data source:
Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990, 1995 to 2003. Prepared for the Canadian Petroleum Products Institute (CPPI) and Canadian Industry Program for Energy Conservation by John Nyboer, Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). January 2005. Simon Fraser University.

Pulp and Paper

Profile

Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides market pulp, the sector produces newsprint, specialty papers, paperboard, building board and other paper products.

Achievements

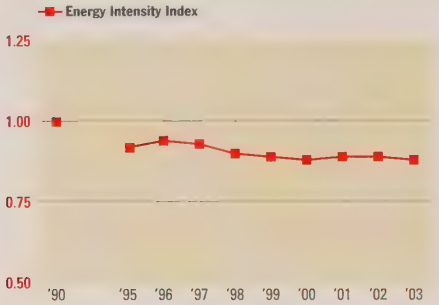
Pulp and paper is Canada's leading industrial user of renewable energy, with biomass and hydro power making up over 55 percent of the sector's energy consumption. The industry's strategy of substituting biomass for fossil fuels and using less emissions-intensive natural gas in place of oil and coal are key components in the industry's success in reducing CO_2 emissions. Since 1990, the industry has cut its oil consumption by 34 percent and essentially eliminated its use of coal.

Between 1990 and 2003, Canadian pulp and paper companies increased their production by 28.2 percent. The sector's energy intensity improved 12.5 percent over the same period, all but meeting its commitment to a 1 percent annual improvement.

Pulp and Paper Sector – NAICS 322100

Energy Intensity Index (1990–2003)

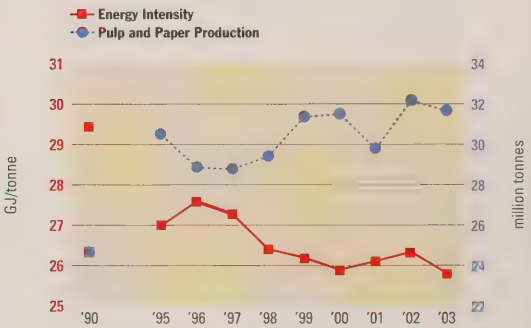
Base Year 1990 = 1.00



Data source:
Forest Products Association of Canada's (formerly the Canadian Pulp and Paper Association) *Energy Monitoring Report, 1990–2003.*

Pulp and Paper Sector – NAICS 322100

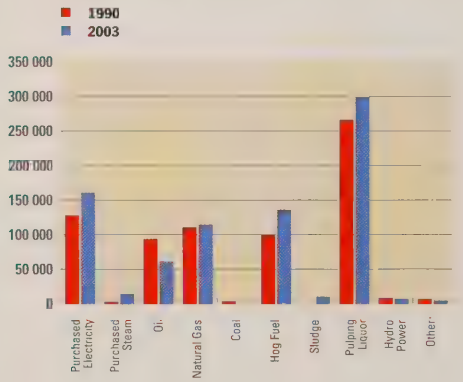
Energy Intensity and Physical Output (1990–2003)



Data source:
Forest Products Association of Canada's (formerly the Canadian Pulp and Paper Association) *Energy Monitoring Report, 1990–2003.*

Pulp and Paper Sector – NAICS 322100

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Forest Products Association of Canada's (formerly the Canadian Pulp and Paper Association) *Energy Monitoring Report, 1990 –2003.*

* Other includes: Distillates, Diesel, LPG (Propane), Other Purchased Energy and Other Self-generated Energy.

Rubber

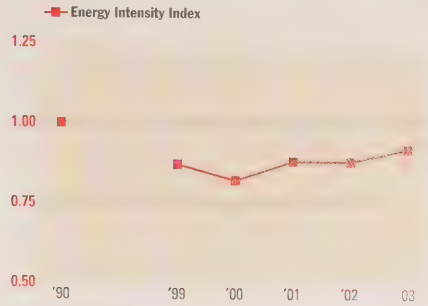
Profile

The rubber products industry is a major contributor to the Canadian economy. It represents over $5 billion in shipments and employs approximately 27 000 people in 375 establishments across the country. The industry is also very active in international trade with imports of $3.8 billion and exports of $3.2 billion.

Rubber Sector – NAICS 326200

Energy Intensity Index (1990–2003)

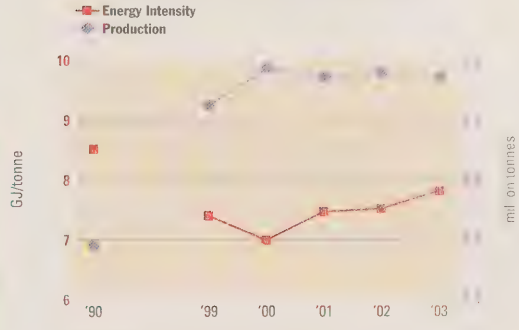
Base Year 1990 = 1.00



Data source:
Rubber Association of Canada, March 2005

Rubber Sector – NAICS 326200

Energy Intensity and Physical Output (1990-2003)



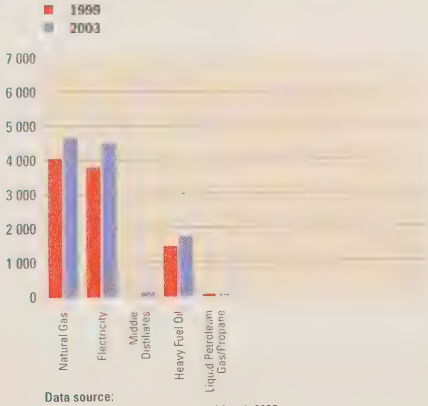
Data source:
Rubber Association of Canada, March 2005

Achievements

In 2003, the sector consumed 11 134 TJ of energy, more than double the consumption in 1990. However, over the same period, production almost tripled, leading to an overall improvement in energy intensity of 8 percent. Between 2002 and 2003, production of rubber products decreased by 1.6 percent, while energy use in the sector increased by 2.4 percent. This led to an increase in energy intensity of 4 percent between 2002 and 2003. The mix of fuels used by the rubber sector has changed very little since 1999, with natural gas and electricity representing over 80 percent of energy consumption.

Rubber Sector – NAICS 326200

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Rubber Association of Canada, March 2005
Due to data collection methodology, data are not available for 1990.

Steel

Profile

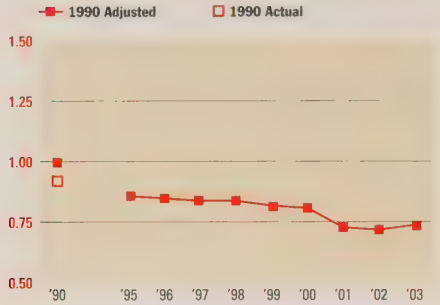
Canada's steel sector is one of the country's largest industries. Sector companies supply flat-rolled (sheet and plate), long (re-bar and structural steel) and specialty and alloy (stainless and tool steels) products for major markets in the automotive, appliance, oil and gas, machinery, construction and packaging industries.

Achievements

The steel industry has grown its output by 18 percent between 1990 and 2003. Over the same period, the sector has lowered its energy intensity by 26.5 percent. The sector's energy intensity performance has leveled off since 2001, and has increased slightly (1.9 percent) from 15.36 GJ/tonne in 2002 to 15.65 in 2003.

Steel Sector – NAICS 331100

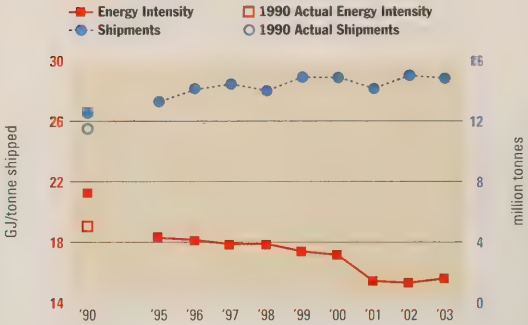
Energy Intensity Index (1990–2003)
Base Year 1990 (adjusted) = 1.00



Data sources:
Energy: 1990 actual and 1995–2003. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* November 15, 2004, per Statistics Canada, Catalogue 57-003-XIB, November 2004.
Shipments: Statistics Canada Catalogue 41-001, *Primary Iron and Steel.*
1990 Adjustment of Energy and Shipments: Canadian Steel Producers Association.

Steel Sector – NAICS 331100

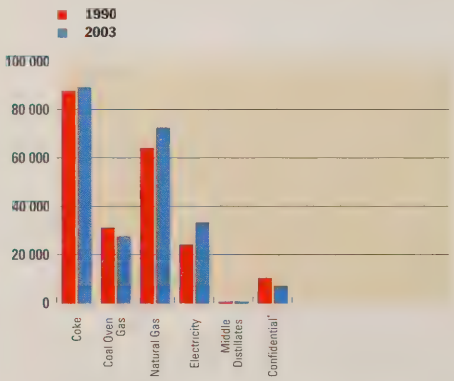
Energy Intensity and Physical Output (1990–2003)



Data sources:
Energy: 1990 actual and 1995–2003. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* November 15, 2004, per Statistics Canada, Catalogue 57-003-XIB, November 2004.
Shipments: Statistics Canada Catalogue 41-001, *Primary Iron and Steel.*
1990 Adjustment of Energy and Shipments: Canadian Steel Producers Association.

Steel Sector – NAICS 331100

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Energy: 1990 actual and 1995–2003. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* November 15, 2004, per Statistics Canada, Catalogue 57-003-XIB, November 2004.

* Confidential data include: Coal, Pet Coke, HFO and LPG (Propane).

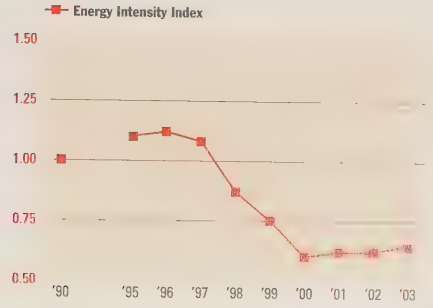
Textiles

Profile

Canada's textile industry produces the fibres, yarns, fabrics and textile articles purchased by users and customers as diverse as automotive manufacturing, clothing, construction, environmental protection, road building and retail.

Textiles Sector – NAICS 313, 314*

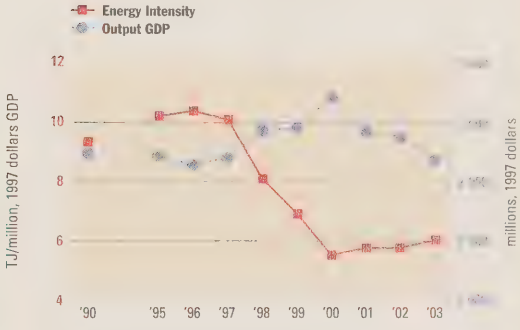
Energy Intensity Index (1990–2003)
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Textiles Sector – NAICS 313, 314*

Energy Intensity and Economic Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University

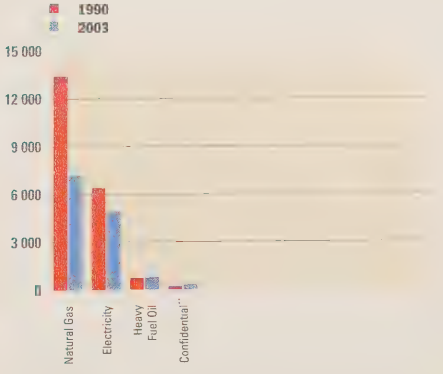
Achievements

The textile industry improved its energy intensity by 35 percent between 1990 and 2003. The sector's actual energy use dropped by 36 percent during the same period, with a slight decrease in the industry's GDP. Since 2000, when the sector's energy intensity reached a 13-year low of 5.53 TJ/million 1997 dollars, it has again risen by nearly 5 percent to 6.03 TJ/million in 2003. The Textiles Sector Task Force remains committed to an energy intensity reduction target of 1 percent per year through 2010. To meet this goal, the industry will build on its significant success in improving energy efficiency in recent years and will continue its ongoing consultations with governments and other stakeholders to help Canada meet its Kyoto Protocol goals.

* The new North American Industry Classification System (NAICS) classifies textile producers under Artificial and Synthetic Fibres/Filaments Manufacturing (NAICS 32522), Textile Mills (NAICS 313) and Textile Product Mills (NAICS 314). NAICS sub-group 32522 includes producers of synthetic fibres and filaments. NAICS Group 313 comprises establishments that are primarily engaged in manufacturing, finishing or processing yarn or fabrics. NAICS Group 314 includes establishments primarily engaged in manufacturing textile products (except clothing) such as carpets, household textiles, etc. Changes to the classification of industries by Statistics Canada from the Standard Industrial Classification (SIC) to NAICS mean that energy data for the synthetic fibre and filament yarn industries are no longer available separately. The statistics contained in this profile cover only NAICS Groups 313 and 314 as described above.

Textiles Sector – NAICS 313, 314*

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

** Confidential data include: LFO (Middle Distillates), LPG (Liquid Propane), and Steam.

Transportation Equipment Manufacturing

Profile

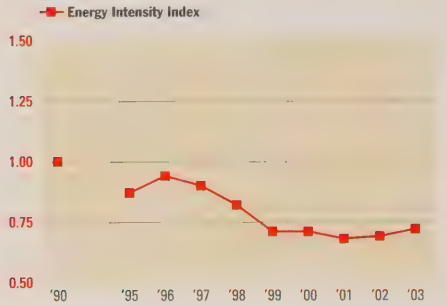
The Canadian transportation equipment manufacturing sector includes companies that manufacture aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers, railroad rolling stock, ships and pleasure boats.

Achievements

In 2003, the value of the transportation equipment manufacturing sector's total output decreased by 2.6 percent, while its energy intensity increased by 4.5 percent. The sector's energy usage for the year increased by 1.8 percent over 2002. In 2003, the sector consumed 63 542 TJ of energy, up 24.4 percent from 1990. However, over the same period, the sector's GDP increased by 72.6 percent, leading to an overall improvement in energy intensity of 28 percent. The share of energy used by fuel type shows a continuing trend toward higher electricity usage (37.3 percent in 2003) and a higher usage of natural gas (53.6 percent). Use of liquid petroleum gases, middle distillates (No. 2 fuel oil) and heavy fuel oil has held comparatively steady.

Transportation Equipment Manufacturing Sector – NAICS 336000

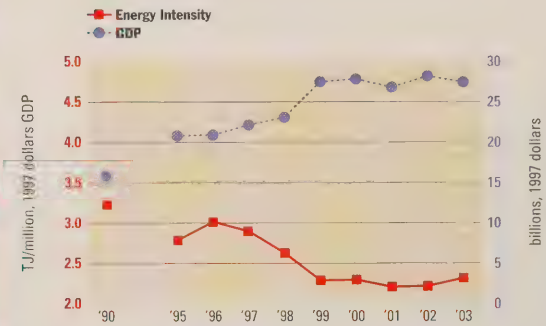
Energy Intensity Index (1990–2003)
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

Transportation Equipment Manufacturing Sector – NAICS 336000

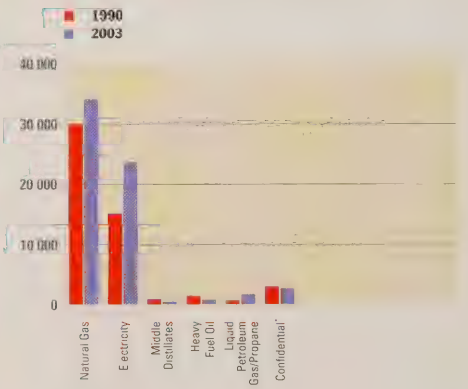
Energy Intensity and Economic Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University

Transportation Equipment Manufacturing Sector – NAICS 336000

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003*. December 23, 2004. Simon Fraser University.

* Confidential data include: Coal, Coal Coke and Steam.

Upstream Oil and Gas

Profile

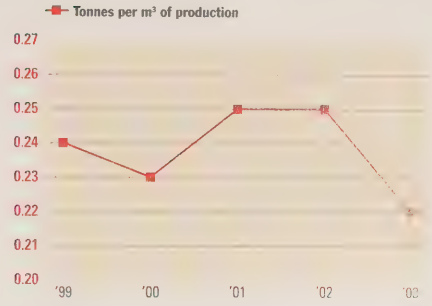
The upstream oil and gas sector includes the companies that find and develop Canada's vast hydrocarbon reserves. Products and services derived from this industry include heating and transportation fuels, building supplies and materials, clothing and vital medicines. The exploration and production industry is represented by the Canadian Association of Petroleum Producers (CAPP) and the Small Explorers and Producers Association of Canada (SEPAC).

Achievements

The sector's GHG emissions intensity has decreased between 1999 and 2003 by 8.3 percent and by 12 percent since 2002. In 2003, it stands at 0.22 tonnes per cubic metre of production.

Upstream Oil and Gas Sector – NAICS 211113

GHG Intensity Index (1999 -2003)



Data source:
CAPP, *2004 Stewardship Progress Report*

Wood Products

Profile

The wood products sector includes three industry groups: establishments engaged in sawing logs into lumber and similar products; companies that make products that improve the natural characteristics of wood by manufacturing veneers, plywood, reconstituted wood panel products and engineered wood assemblies; and establishments that make a diverse range of wood products, such as millwork.

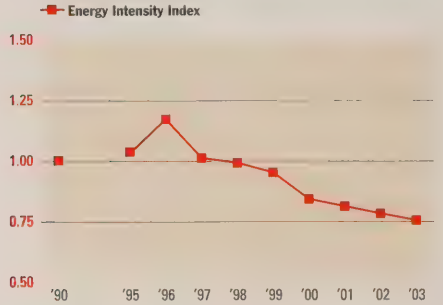
Achievements

Canada's wood products sector consumed 132 956 TJ of fossil fuel and electricity in 2003. Although rising production in the sector has driven energy consumption upward since 1990, actions taken by companies to boost energy efficiency have also led to substantial improvements in energy intensity. Between 1990 and 2003, the sector's energy intensity improved by 25 percent. This sector continues to make good progress in steadily lowering its energy intensity while increasing GDP. Throughout the industry, companies continue to install cost-effective biomass energy systems based on wood waste, displacing the use of costly natural gas. A continuing escalation in energy prices provides a powerful incentive for manufacturers of wood products to implement low-cost energy efficiency measures.

Wood Products Manufacturing Sector – NAICS 321000

Energy Intensity Index (1990–2003)

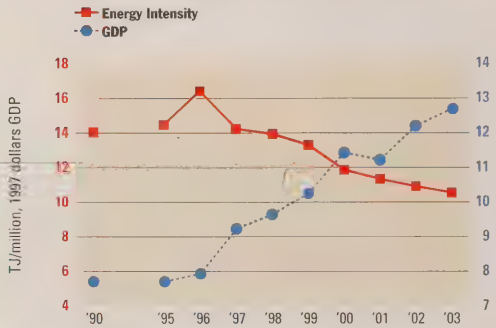
Base Year 1990 = 1.00



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Wood Products Manufacturing Sector – NAICS 321000

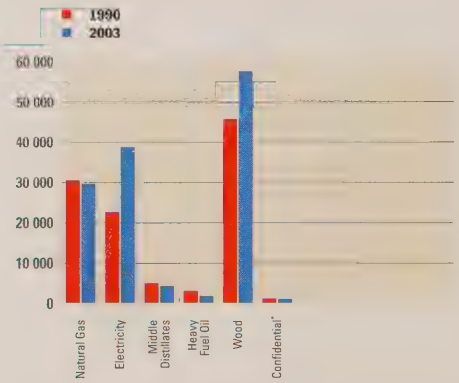
Energy Intensity and Economic Output (1990–2003)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

Wood Products Manufacturing Sector – NAICS 321000

Energy Sources in Terajoules per Year (TJ/yr)



Data source:
Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2003.* December 23, 2004. Simon Fraser University.

* Confidential data include: LPG (Propane) and Steam.

Between 1994 and 2002, Industrial Energy Innovator Devon Canada Corporation implemented over 100 emissions reduction projects with a total carbon dioxide equivalent impact greater than 1.2 megatonnes.

How CIPEC Works

CIPEC is an umbrella organization overseeing a partnership between government and private industry aimed at improving Canada's industrial energy efficiency. CIPEC comprises sectoral task forces, each of which represents companies engaged in similar industrial activities, that participate through their trade associations. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share ideas and recommends ways to address common needs. Overall direction is provided by an Executive Board, which is made up of private sector leaders who are champions of industrial energy efficiency within their sectors and who provide advice on industrial energy efficiency programs and related issues to the Government of Canada.

In the CIPEC partnership, change emerges from consensus and joint action built through open and honest communication. CIPEC continues to be the focal point for industry's response to Canada's climate change efforts. Our role is to promote the evolution of energy efficiency and to recognize and reward those who lead the way.

We carry out this mandate in part through a strong communications and awareness program anchored in our twice-monthly *Heads Up CIPEC* newsletter and in regular features in selected trade magazines. There are now close to 10 000 regular readers of this publication.

CIPEC also raises awareness of the goals and benefits of improved energy use in other ways. The Task Force Council and individual sectors are constantly at work to broaden participation, encourage the sharing of information and bolster awareness of the role and achievements of CIPEC industries. The frequency of CIPEC meetings and other gatherings continues to increase, with an average of three CIPEC events occurring per week during the past reporting period.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The profile of these leaders and their strong belief in CIPEC's principles give us a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

The Evolution of CIPEC Data

CIPEC sectors in this report are organized in accordance with the North American Industry Classification System (NAICS). NAICS replaces the Standard Industrial Classification (SIC) system used in previous years. The switch was made to bring Canada's classification system in line with Mexico and the United States, its partners in the North American Free Trade Agreement, and involved sub-sector realignment. In addition, the GDP dollar values reported here have been updated to reflect a 1997 base year. CIPEC annual reports for 2000/2001 and earlier were based on a 1986 base year.

Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. Data used in this report are collected primarily by Statistics Canada and supplemented by information from associations participating in CIPEC and from other government bodies. The information is interpreted by the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in Burnaby, British Columbia. CIEEDAC then produces energy intensity indicators for each sector based on production and GDP.

The cooperative CIEEDAC system is internationally recognized for its methodologies, data integrity and cooperation with CIPEC. Primary funding for CIEEDAC comes from NRCan, with additional contributions from industry associations that participate in CIPEC and from the province of Quebec.

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Industrial Energy Innovators

Through NRCan's Office of Energy Efficiency (OEE), the Industrial Energy Innovators initiative focuses on transforming sector-level commitments made by task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of February 28, 2005, 643 industrial companies from the manufacturing, mining, construction and energy-producing sectors have signed on as Industrial Energy Innovators.

For information on the benefits of becoming an Industrial Energy Innovator, contact the OEE by e-mail at cipec.peeic@nrcan.gc.ca or visit the Web site at oee.nrcan.gc.ca/cipec.

Industrial Energy Innovators by Sector

Aluminum
Alcan inc.
Alcoa – Aluminerie de Baie-Comeau
Alcoa – Aluminerie Deschambault inc.
Alumicor Limited
Aluminerie Alouette inc.
Aluminerie de Bécancour inc.
Indalex Limitée – Pointe-Claire

Brewery
Big Rock Brewery Ltd.
La Brasserie Labatt
Labatt Breweries of Canada
Molson Canada – Edmonton
Molson Canada – Ontario
Moosehead Breweries Limited
Sleeman Brewing and Malting Co. Ltd.

Cement
ESSROC Canada Inc.
Gordon Shaw Concrete Products Ltd.
Lafarge Canada inc.
Lehigh Inland Cement Limited
Lehigh Northwest Cement Limited
St. Lawrence Cement Inc.
St. Marys Cement Corporation

Chemical
Abrex Paint & Chemical Ltd.
Alcan Chemicals
Benjamin Moore & Cie Limitée
Big Quill Resources Inc.
Brenntag Canada Inc.
Chinook Group Limited
Degussa Canada Inc.
Dominion Colour Corporation
Huntsman Corporation Canada Inc.
ICI Canada Inc.
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
Osmose-Pentox Inc.
Oxy Vinyls Canada Inc.
Pharmascience inc.
PolyOne Canada Inc.
Rohm and Haas Canada Inc.
Saskatchewan Mineral

Construction
ATCO Structures Inc.
GSW Building Products
IKO Industries Ltd.
– Brampton
– Hawkesbury
Lockerbie & Hole Industrial Inc.
Mira Timber Frame Ltd.
Northland Building Supplies Ltd.
Waiward Steel Fabricators Ltd.

Dairy
Agrinor Inc. (Laiterie Alma)
Agropur Coopérative Agro-alimentaire
Amalgamated Dairies Limited
Atwood Cheese Company
Baskin-Robbins Ice Cream
Entreprise Le Mouton Blanc
Foothills Creamery Limited
Hewitt's Dairy Limited
Laiterie Chagnon Ltée
Lone Pine Cheese Ltd.
Neilson Dairy Ltd.
Parmalat Dairy & Bakery Inc.
Pine River Cheese & Butter Co-operative
Roman Cheese Products Limited
Salerno Dairy Products Ltd.

Electrical and Electronics
Alstom Canada inc.
ASCO Valve Canada
Broan-NuTone Canada
CAE Inc.
Camco Inc.
Candor Industries Inc.
Century Circuits Inc.
Circuits GRM Enr.
Crest Circuits Inc.
Honeywell Limited
IBM Canada Limitée
Milplex Circuits (Canada) Inc.
Nortel
Osram Sylvania Ltd.
PC World
Tyco Thermal Controls (Canada) Ltd.
Vansco Electronics Ltd.

Electricity Generation
Ontario Power Generation

Fertilizer
Agrium
IMC Esterhazy Canada Limited Partnership
IMC Potash Canada Limited
IMC Potash Colonsay ULC
Potash Corporation of Saskatchewan Inc.
– Allan Division
– Cory Division
– Lanigan Division
– New Brunswick Division
– Patience Lake
– Rocanville Division

Food and Beverage
Abattoir Louis Lafrance & Fils Ltée
Abattoir Saint-Germain inc.
ACA Co-operative Limited
Agri-Marché
Alberta Processing Co.
(Division of West Coast Reduction Ltd.)
Aliments Ouimet-Cordon Bleu Inc.
Aliments Reinhart Foods Limited/Ltée
Andrés Wines Ltd.
API Grain Processors
Beta Brands Limited
Better Beef Ltd.
Black Velvet Distilling Company
Bunge Canada
Burnbrae Farms Limited
Canamera Foods
Canbra Foods Ltd.
Cantor Bakery
Canyon Creek Soup Company Ltd.
Cargill Animal Nutrition
– Camrose
– Lethbridge
Cargill Foods
– High River
– Toronto
Carson Foods
Casco Inc.
Cavendish Farms
Centennial Foods, a Partnership
Champion Petfoods Ltd.
Coca-Cola Bottling Company
– Toronto
– Calgary
Cold Springs Farm Limited
Connors Bros., Limited
Continental Mushroom Corporation
(1989) Ltd.
Cuddy Food Products Inc.
Don Chapman Farms Ltd./Lakeview
Vegetable Processing Inc.
Eastern Protein Foods Inc.
Effem Inc.
– Bolton
– Newmarket
Family Muffins & Desserts Inc.
Farmers Co-Operative Dairy Limited – Halifax
Furlani's Food Corporation
Greenview AquaFarm Ltd.
H.J. Heinz Company of Canada Ltd.
Handi Foods Ltd.
Heritage Frozen Foods Ltd.
Hershey Canada Inc.
Hubberts Industries
Humpty Dumpty Snack Foods Inc.
– Summerside
Kraft Canada Inc.
La Rocca Creative Cakes
Legacy Cold Storage Ltd.
Legal Alfalfa Products Ltd.
Les Brasseurs Du Nord Inc.
Les Distilleries Schenley Inc.
Les Oeufs-Bec-O inc.
Les produits Zinda Canada Inc.
Lilydale Cooperative Ltd.
Lucerne Foods
Lyo-San Inc.
Maison des Futailles
Maple Leaf Foods Inc.
– Canada Bread Company Ltd.
– Garden Province Meats Inc.
– Landmark Feed Inc.
– Larsen Packers Limited
– Maple Leaf Consumer Foods
– Maple Leaf Pork
– Maple Leaf Poultry
– Rothsay
– Shur-Gain
Maple Lodge Farms Ltd.
Marsan Foods Limited
McCain Foods (Canada)
Mitchell's Gourmet Foods Inc.
Nestlé Canada Inc.
– Midwest Food Products Inc.

Industrial Energy Innovators by Sector (continued)

Food and Beverage (continued)

Northern Alberta Processing Co.
Oakrun Farm Bakery Ltd.
Ocean Nutrition Canada Ltd. – Dartmouth
Okanagan North Growers Cooperative
Olymel
Otter Valley Foods Inc.
Parrish & Heimbecker Limited
PepsiCo Foods of Canada Inc.
– Peterborough
– Trenton
Pepsi-Cola Canada Beverages
Prairie Mushrooms (1992) Ltd.
Principality Foods Ltd.
Quality Fast Foods
Sakai Spice (Canada) Corporation
Schneider Foods
– Ayr
– Kitchener
– Mississauga
– Port Perry
– Toronto
Silani Sweet Cheese Ltd.
Stratus Vineyards Limited
Sunny Crunch Foods Ltd.
Sunrise Bakery Ltd.
Sun-Rype Products Ltd.
Sunterra Meats
Sun Valley Foods Canada
The Hostess Frito-Lay Company
Thomson Meats Ltd.
Town Line Processing Ltd.
Transfeeder Inc.
Trochu Meat Processors
Trophy Foods
Unifeed & Premix
Unilever Canada
Versacold Group
Viandes Kamouraska Inc.
Vincor International Inc.
Westcan Malting Ltd.
Westglen Milling Ltd.
Weston Foods Inc.

Foundry

Ancast Industries Ltd.
Bibby Ste-Croix
Breyer Casting Technologies Inc.
Century Pacific Foundry Ltd.
Crowe Foundry Limited
Dana Brake Parts Canada Inc.
Deloro Stellite Inc.
ESCO Limited
– Port Coquitlam
– Port Hope
Gamma Foundries Company
Grenville Castings Limited
M.A. Steel Foundry Ltd.
Magotteaux Ltée
Metal Technologies Woodstock Ltd.
Ramsden Industries Limited
Stackpole Limited
Vehcom Manufacturing
Wabi Iron & Steel Corporation
Welland Forge

General Manufacturing

3M Canada Co.
Acadian Platers Company Limited
Advanced Panel Products Ltd.
Armstrong World Industries Canada
Artopex Plus Inc.
Avery Dennison Fasson Canada Inc.
Babcock & Wilcox Canada Ltd.
BainUltra Inc.
Basin Contracting Limited
Batteries Power (Iberville) Ltée
Bentofix Technologies Inc.
Blount Canada Ltd.
BOC Gaz
Canadian Uniform Limited
Cancoil Thermal Corporation
Canwood Furniture Inc.
Caraustar Industrial & Consumer Products Group
Carrière Union Ltée
CCL Container Aerosol Division
Champion Feed Services Ltd.
Church & Dwight Canada
Climatizer Insulation Inc.
Columbia Industries Limited
Courus s.e.c.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Descor Industries Inc.
Dipaolo CNC Retrofit Ltd.
Douglas Barwick Inc.
Eli Lilly Canada Inc.
Emco Building Products Corp.
– Edmonton
– Pont-Rouge
– Ville LaSalle
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Estée Lauder Cosmetics Ltd.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Limited
Ferraz Shawmut Canada Inc.
Fibrex Insulations Inc.
Garland Commercial Ranges Limited
General Services Inc.
Genfoot Inc.
Glueckler Metal Inc.
Greif Containers Inc.
Henkel Canada Corporation, Consumer Adhesives
Ibis Products Limited
IKO Industries Ltd. – Brampton
Imaflex Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Canada
Imprimerie Interweb inc.
Indalex Limited – Port Coquitlam
Independent Mirror Industries Inc.
Integria
Interface Flooring Systems (Canada) Inc.
International Paper Industries Limited
J.A. Wilson Display Ltd.
Jones Packaging Inc.
JTI-Macdonald Corp.
JTL Integrated Machine Ltd.
Kindred Industries Ltd.
Kodak Canada Inc.
Korex Canada
Korex Don Valley ULC
La Compagnie Américaine de Fer et Métaux inc.
Leggett & Platt Canada Co.
Les Distributions Option Kit Inc.
Les Emballages Knowlton inc.
Les Technologies Fibrox Ltée
Madawaska Doors Inc.
Maksteel Service Centre
Maritime Geothermal Ltd.
Metex Heat Treating Ltd.
Metro Label Company Ltd.
Metroland Printing, Publishing & Distributing
Meuble Idéal Ltée
Mobilier MEQ Ltée
Mondo America Inc.
Montebello Packaging
Nexans Canada Inc.
North American Decal
Norwest Precision Limited
Orica Canada Inc.
Owens-Corning Canada Inc.
– Candiac
– Toronto
P. Baillargeon Ltée
Pavage U.C.P. inc.
Placage Chromex Inc.
Polytainers Inc.
PowerComm Inc.
Procter & Gamble Inc.
– Belleville
– Brockville
PRO-ECO Limited
RLD Industries Ltd.
Rothmans, Benson & Hedges Inc.
Russel Metals Inc. (Alberta)
S.C. Johnson and Son, Limited
Saint-Gobain Ceramic Materials Canada Inc.
Samuel Strapping Systems
Sandvik Materials Technology Canada
Sandvik Tamrock Canada Inc.
Sandvik Tamrock Loaders Inc.
Scapa Tapes North America
Simmons Canada Inc.
Snap-on Tools of Canada Ltd.
Société Laurentide inc.
Soprema inc.
Steelcase Canada Ltd.
Stowe Woodward/Mount Hope Inc.

Suntech Heat Treating Ltd.
Superior Radiant Products Ltd.
Systèmes et Câbles d'Alimentation Pirelli Canada
Teknion Corporation
Teknion Roy & Breton Inc.
– RBLogistek – St-Romuald, QC
– RBTek – St-Romuald, QC
– Roy & Breton – St-Vallier, QC
– Teknion Concept – Lévis, QC
– Teknion Québec – Montmagny, QC
TekWood
Thermetco Inc.
Transcontinental Gagné
Transcontinental Interweb Toronto
Tuyaux Wolverine (Canada) inc.
Unifiller Systems Inc.
V.N. Custom Metal Inc.
VA TECH Ferranti-Packard Transformers Ltd.
VicWest Steel
Wabash Alloys Mississauga
Wescam Inc.
Wheeltronic Ltd.
Wyeth-Ayerst Canada Inc.
Zenon Environmental Inc.

Lime

Carmeuse Beachville (Spragge Operations) Limited
Carmeuse Lime (Beachville) Limited
Carmeuse Lime (Dundas) Limited
Chemical Lime Company of Canada Inc.
Graymont (NB) inc.
Graymont (QC) Inc.
Graymont Western Canada Inc.

Mining

Aur Resources Inc.
Barrick Gold Corporation – Mine Doyon
BHP Billiton Diamonds Inc.
Boliden Limited
Echo Bay Mines Ltd.
Falconbridge Limited
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Limited
INCO Limited
Iron Ore Company of Canada
La Compagnie Minière Québec Cartier
Métallurgie Noranda inc. – Fonderie Horne
Mines Wabush
Newmont Canada Limited, Golden Giant Mine
Noranda inc. – Matagami Mines
Noranda Inc. – Brunswick Mining
Noranda Inc. – Brunswick Smelter
Noranda Metallurgy Inc. – Canadian Copper Refinery
Placer Dome Canada Limited
Sifto Canada Inc.
Syncrude Canada Ltd.
Teck Cominco Limited
Williams Operating Corporation
Zinc Électrolytique du Canada Ltée.

Petroleum Products

Bitumar Inc.
Canadian Tire Petroleum
Chevron Canada Resources
Husky Energy Inc.
Imperial Oil Limited
Irving Oil Limited
Northrock Resources Ltd.
Parkland Refining Ltd.
Petro-Canada
Pound-Maker Agventures Ltd.
Rider Resources Ltd.
Safety-Kleen Canada Inc.
Shell Canada Limited
Suncor Energy Inc.
Ultramar Ltd.

Plastics

ADS Groupe Composites Inc.
Atlantic Packaging Products Ltd.
Bérou International inc.
D&V Plastics Inc.
Downeast Plastics Ltd.
Emballage St-Jean Ltée
Husky Injection Molding Systems Ltd.
IPEX Inc.
Kord Products Inc.
Matrix Packaging Inc.
Par-Pak Ltd.
Reid Canada Inc.
Richards Packaging Inc.
Rubbermaid Canada Inc.
Silgan Plastics Canada Inc.
The Clorox Company of Canada, Ltd.
W. Ralston (Canada) Inc.
Wedco Produits Moulés
Winpak Portion Packaging Ltd.

Pulp and Paper

Abitibi-Consolidated Inc.
Bowater Canadian Forest Products Inc.
Cariboo Pulp and Paper Company Limited
Cascades inc.
– Cascades Boxboard Inc./Cascades Carton Plat inc.
– Cascades Fine Papers Group Inc./ Cascades Groupe Papiers Fins inc.
– Cascades Tissue Group Inc./ Cascades Groupe Tissu inc.
Daishowa-Marubeni International Ltd.
Domtar inc.
– Espanola
– Lebel-sur-Quévillon
– Ottawa/Hull
Emballages Mitchel-Lincoln Ltée
Emballages Smurfit-Stone Canada inc.
Eurocan Pulp and Paper Company Limited
F.F. Soucy Inc.
Georgia-Pacific Canada, Inc. – Thorold
Interlake Paper
Kruger Inc.
Lake Utopia Paper
Marathon Pulp Inc.
Maritime Paper Products Limited
Neenah Paper Company of Canada
Norampac Inc.
NorskeCanada
Papiers Scott Limitée
– Crabtree
– Lennoxville
Papiers Stadacona
Pope & Talbot Ltd.
Sac Drummond inc.
Smurfit-Stone
St. Anne-Nackawic Pulp Company
St. Marys Paper Ltd.
Standard Paper Box
Stora Enso Port Hawkesbury Ltd.
Tembec Paper Group – Spruce Falls Operations
Tolko Manitoba Kraft Paper
UPM-Kymmene Miramichi Inc.
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.

Rubber

AirBoss Rubber Compounding
GDX Canada Inc.
Goodyear Canada Inc.
Hamilton Kent Canada Ltd.
Michelin North America (Canada) Inc.
NRI Industries Inc.
Trent Rubber Corp.

Steel

Abraham Steel & Services Ltd.
Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels
CHT Steel Company Inc.
Dofasco Inc.
Gerdau Ameristeel Corporation
– Cambridge
– Whitby
Ivaco Inc. – Ivaco Rolling Mills
Laurel Steel
Namasco Limited
Norambar inc.
Ontario Chromium Plating Inc.
QIT – Fer et Titane inc.
Slater Steel Inc. – Hamilton Specialty Bar Division
Stelco Hamilton
Stelco Inc.
Stelco Lake Erie
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.

Industrial Energy Innovators by Sector (continued)

Textiles

Albany International Canada Inc.
Albarrie Canada Limited
American & Efird Canada, inc.
AYK Socks Inc.
Barrday Inc.
Beaulieu Canada Inc. – Acton Vale
Bennett Fleet (Quebec) Inc.
C.S. Brooks Canada Inc.
Cavalier Textiles
Coats Bell
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Colorama Dyeing and Finishing Inc.
Consoltex Inc.
CookshireTex inc.
Denim Swift
Dentex
Domfoam International Inc.
Doubletex Inc.
DuPont Canada Inc.
Fabrene Inc.
J.L. de Ball Canada Inc.
Jack Spratt Mfg Inc.
LaGran Canada Inc.
Lainages Victor Ltée
Lanart Rug Inc.
Lincoln Fabrics Ltd.
Manoir Inc.
Manufacturier de bas de nylon Doris Ltée
Mondor Ltée
Morbern Inc.
Nova Scotia Textiles, Limited
PGI-DIFCO Tissus Performance Inc.
Spinrite Inc.
St. Lawrence Corporation
Stanfields Ltd.
Stedfast Inc.
Teinturiers Concorde inc.
Textiles Monterey (1996) inc.
The Cambridge Towel Corporation
Tri-Tex Co Inc.
Velcro Canada Inc.
Vitafoam Products Canada Ltd.
VOA Colfab Inc.
Waterloo Textiles Limited

Transportation Equipment Manufacturing

ABC Group Inc.
– ABC Air Management Systems Inc. (Multi-Flex)
– ABC Climate Control Systems Inc.
– ABC Flexible Engineered Products Inc. (Extrusion)
– ABC Group Exterior Systems
– ABC Group Interior Systems
– ABC Group Product Development
– ABC Metal Products Inc.
– ABC Plastic Moulding
  – Brydon
  – Orlando
– LCF Manufacturing Ltd.
  – Rexdale
  – Weston
– MSB Plastics Manufacturing Ltd.
– PDI Plastics Inc.
– Polybottle Group Limited
  – Edmonton
  – Vancouver
– Salflex Polymers Ltd.
– Salga Associates
– Supreme Tooling Group
Accuride Canada Inc.
Active Burgess Mould & Design
Advanced Brake Products Ltd.
Air Canada Technical Services
Boeing Toronto Limited
Bombardier Aerospace
Bombardier Inc.
Bovern Enterprises Inc.
Burlington Technologies Inc. – Burlington
Cami Automotive Inc.
Canadian General-Tower Limited
Canadian Pacific Railway
DaimlerChrysler Canada Inc.
Dresden Industrial
– Rodney
– Stratford
Dura Automotive Systems (Canada), Ltd.
Dura-Lite Heat Transfer Products Ltd.
DynaPlas Ltd.
Équipement Labrie Ltée
F & P Mfg., Inc.
Faurecia Automotive Seating
Ford Motor Company of Canada, Limited
Freightliner of Canada Ltd. – Sterling Trucks Division
General Motors of Canada Limited
Honda of Canada Mfg.
Iafrate Machine Works Ltd.
International Truck and Engine Corporation Canada
Lear Corporation
Litens Automotive Parnership – Woodbridge
Montupet Ltée
National Steel Car Limited
Nemak of Canada – Windsor
Niagara Piston Inc.
Oetiker Limited
Omron Dualtec Automotive Electronics Inc.
Orenda Aerospace Corporation
Orion Bus Industries Inc.
Oxford Automotive Inc.
Polywheels Manufacturing Limited
Portec Produits Ferroviaires Ltée
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Production Paint Stripping Ltd.
R. Reininger & Son Limited
Remtec Inc.
Rockwell Automation Canada Inc.
– Cambridge
– Stratford
Russel Metals Inc.
Siemens VDO Automotive Inc.
Simcoe Parts Service Inc.
The Butcher Engineering Enterprises Limited
Toyota Motor Manufacturing Canada Inc.
TRW Automotive
TS Tech Canada Inc.
Volvo Cars of Canada Ltd.
Waterville TG Inc.
Woodbridge Foam Corporation
ZF Heavy Duty Steering Inc.

Upstream Oil and Gas

AltaGas Services Inc. – Wabasca
BP Canada Energy Company
Crescent Point Energy Trust – Provost
Connacher Oil and Gas Limited
ConocoPhillips Canada (North) Limited
Devon Canada Corporation
Enbridge Pipelines Inc.
Husky Oil Operations Ltd.
Keyspan Energy Canada
Newalta Corporation
Nexen Canada Ltd.
Paramount Resources Ltd.
Pengrowth Corporation
Penn West Petroleum Ltd.
Taurus Exploration Ltd
Trans World Oil & Gas Ltd.

Wood Products

Canfor Corporation
Erie Flooring and Wood Products
Finewood Flooring & Lumber Limited
Fiready Inc.
Flakeboard Company Limited
Groupe Savoie Inc.
Industries Maibec inc. – St-Pamphile
K&C Silviculture Ltd.
Les Ateliers Blais & Simard Ébénisterie
Les Entreprises Interco inc.
Louisiana Pacific Canada Ltd.
Marcel Lauzon Inc.
MDF La Baie inc.
New Skeena Forest Products Inc.
Nexfor Inc.
North Atlantic Lumber Inc.
Rip-O-Bec inc.
Riverside Forest Products Limited
Tembec Inc.
Weyerhaeuser Canada Ltd.

Association Members

Aerospace Industries Association of Canada

Alberta Food Processors Association

Aluminium Association of Canada

Automotive Parts Manufacturers' Association

Baking Association of Canada

Brewers of Canada

Canadian Association of Metal Finishers

Canadian Association of Petroleum Producers

Canadian Chamber of Commerce

Canadian Chemical Producers' Association

Canadian Construction Association

Canadian Council of Grocery Distributors

Canadian Electricity Association

Canadian Fertilizer Institute

Canadian Foundry Association

Canadian Gas Association

Canadian Lime Institute

Canadian Manufacturers & Exporters (CME)

– CME Alberta Division

– CME British Columbia Division

– CME Manitoba Division

– CME New Brunswick Division

– CME Newfoundland Division

– CME Nova Scotia Division

– CME Ontario Division

– CME Prince Edward Island Division

Canadian Meat Council

Canadian Petroleum Products Institute

Canadian Plastics Industry Association

Canadian Steel Environmental Committee
(Canadian Steel Producers Association)

Canadian Textiles Institute

Canadian Vehicle Manufacturers' Association

Cement Association of Canada

Council of Forest Industries

Electro-Federation Canada

Fisheries Council of Canada

Food and Consumer Products Manufacturers of Canada

Forest Products Association of Canada

Forintek Canada Corporation

Mining Association of Canada

North American Insulation Manufacturers Association

Ontario Agri Business Association

Ontario Food Producers' Association

Packaging Association of Canada

Québec Forest Industries Association

Rubber Association of Canada

Small Explorers and Producers Association of Canada

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Glossary of Terms

Annual Census of Mines
NRCan survey that collects information on NAICS 2122 (Metal Mining) and NAICS 2123 (Non-Metal Mineral Mining and Quarrying). Full name is Annual Census of Mines, Quarries and Sand Pits.

Annual Survey of Manufactures (ASM)
Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity (CPFE) for approximately 230 sub-sectors at four-digit NAICS code levels.

Base Year
A reference year. For the Framework Convention on Climate Change, 1997 is the base year.

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
VCR Inc. encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports.

Carbon Dioxide (CO_2)
A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions that do not involve combustion.

Carbon Dioxide Equivalent (CO_2e)
A metric measure used to compare the emissions of the different GHGs based upon their global warming potential. Global warming potentials are used to convert GHGs to CO_2e.

Economic Energy Intensity
Energy consumption per unit of economic output.

Embodied Energy
The energy consumed to transform all upstream raw materials into the final product; in a life-cycle approach, it would be the "cradle to grave" energy burden.

Energy Intensity
Energy consumption per unit of output.

Energy Intensity Indicator
A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures
Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change
United Nations convention to address climate change, signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)
A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxide (N_2O). By far the most abundant GHG is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)
The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Higher Heating Value
The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy Survey (ICE)
Statistics Canada survey on energy use. Covers purchased and non-purchased energy for approximately 24 industrial sub-sectors.

Large Final Emitters
Large final emitters are companies that produce goods in emissions-intensive sectors, including primary energy production, electricity production and selected areas of mining and manufacturing production. The Climate Change Plan for Canada defines sectors as large final emitters using the following criteria:

- annual average emissions of 8 kilotonnes of CO_2e per establishment or more; and
- annual average emissions of 20 kilograms of CO_2e per $1,000 gross production or more.

Large Final Emitters Group
The Large Final Emitters Group of NRCan was established in late 2002 and is responsible for working with key industry sectors to reduce annual GHG emissions. Projections show that large industrial emitters could produce about half of Canada's total GHG emissions by 2010. In accordance with the Climate Change Plan for Canada, large industrial emitters are to reduce their emissions by 55 megatonnes of CO_2e. Through its discussions with industry, provinces and territories and other stakeholders, the Large Final Emitters Group will design policies and measures that encourage reductions of this magnitude, are administratively efficient and clear, and help to maintain the competitiveness of Canadian industry.

Lower Heating Value
The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Glossary of Terms (continued)

Natural Resources Canada (NRCan)
The predominant natural resource department of the Government of Canada, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Nitrogen Dioxide (NO_2)
One of a group of gases called nitrogen oxides, which are composed of nitrogen and oxygen. Like sulphur dioxide, nitrogen oxides can react with other chemicals in the atmosphere in the presence of sunlight to form acidic pollutants, including nitric acid.

Nitrogen Oxides (NO_x)
The sum of nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides react with volatile organic compounds in the presence of sunlight to form ground-level ozone.

North American Industry Classification System (NAICS)
A classification system that categorizes establishments into groups with similar economic activities. The structure of NAICS, adopted by Statistics Canada in 1997 to replace the 1980 Standard Industrial Classification (SIC) system, has been developed by the statistical agencies of Canada, Mexico and the United States.

Physical Energy Intensity
Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)
Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are gathered principally by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)
Energy consumption per physical unit of output (also called physical energy intensity).

Standard Industrial Classification (SIC)
A classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada
Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyze, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Sulphur Oxides (SO_x)
A product of combustion of fuels that contain sulphur. Sulphur oxides are a major component of acid rain.

Tier I
Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are pulp and paper, petroleum refining, cement, mining, steel, chemicals and aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II
Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.

For more information or to receive additional copies of this publication, contact

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